

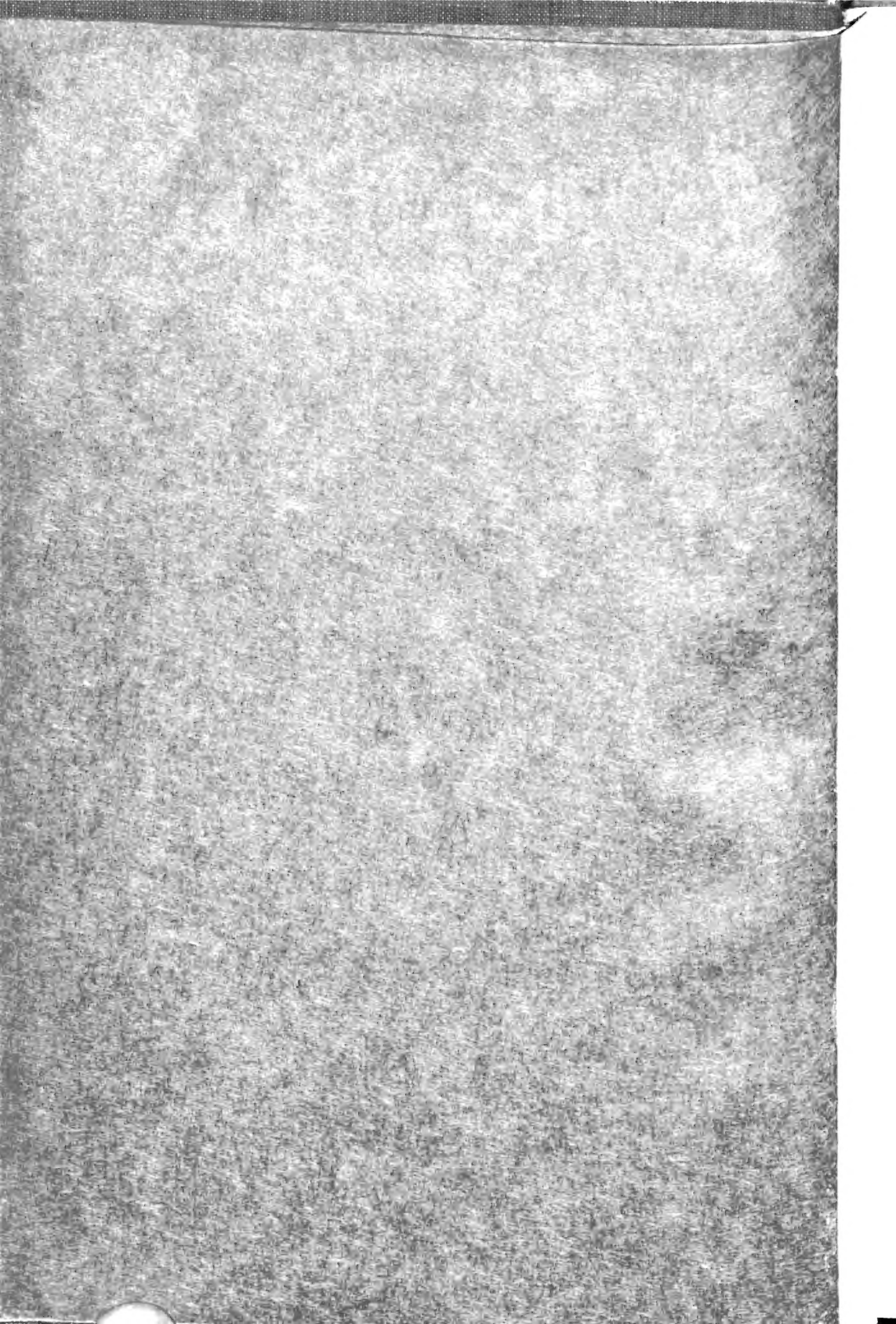
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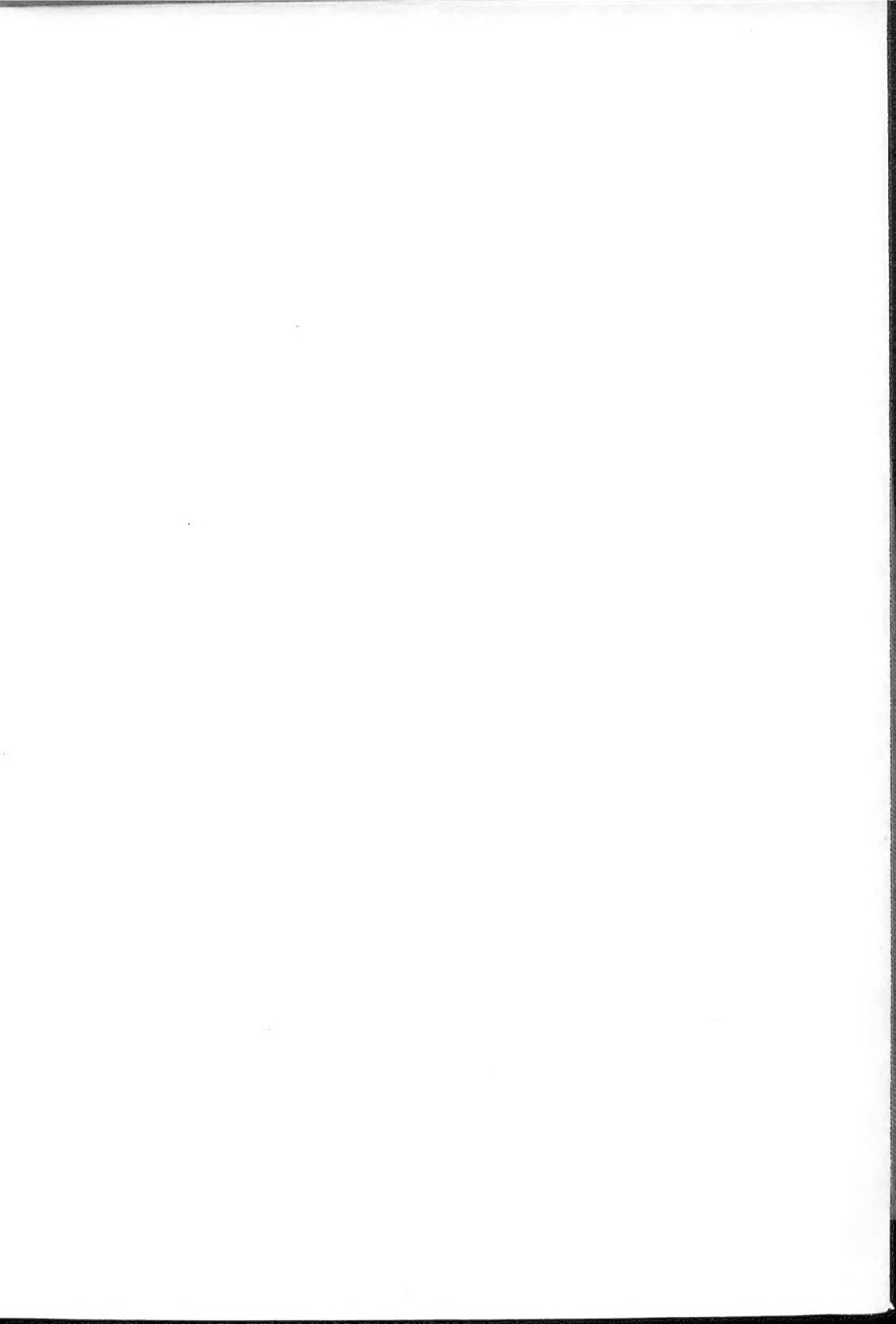


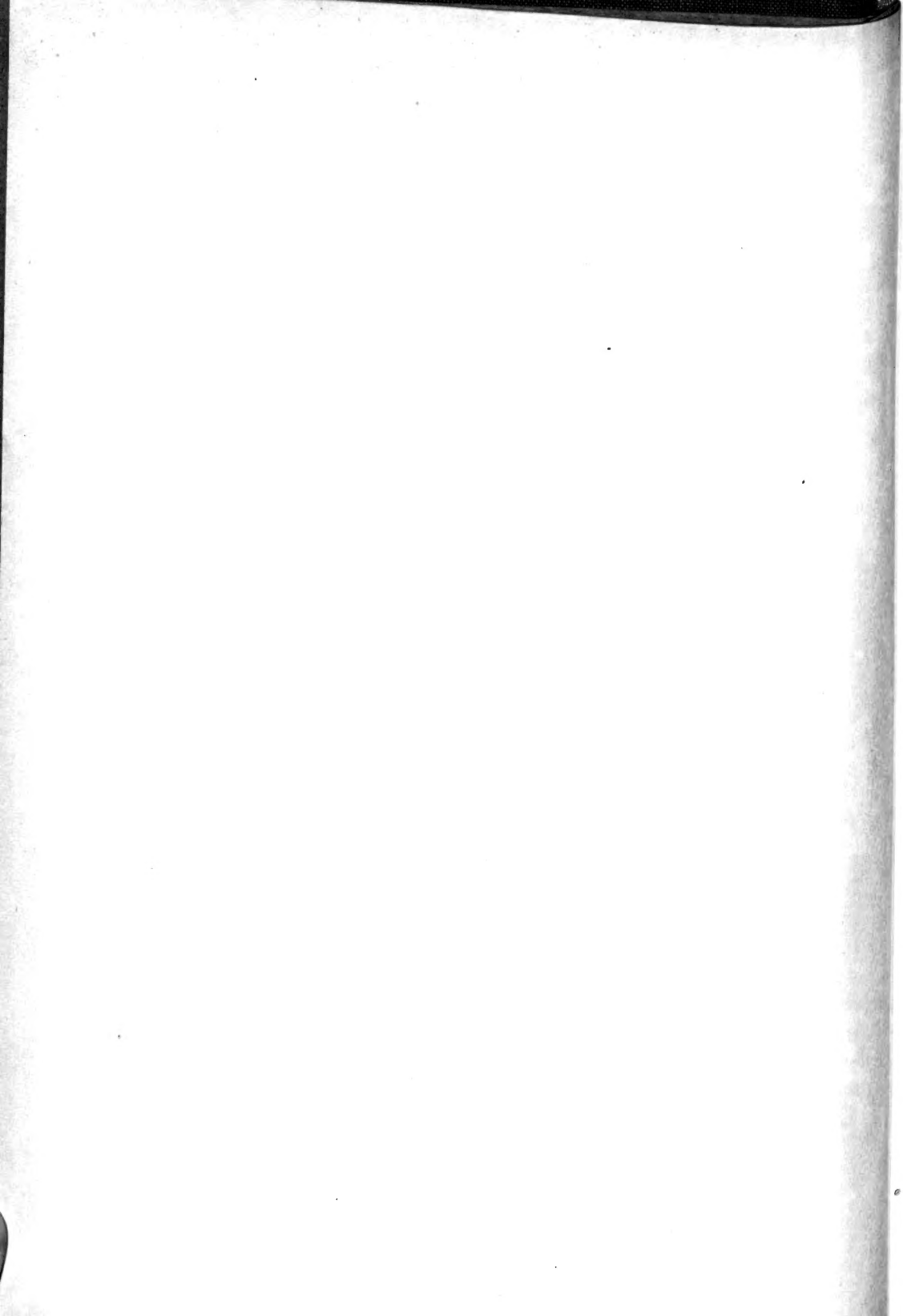
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Descriptions of new Arachnida from South Africa

By JOHN HEWITT.

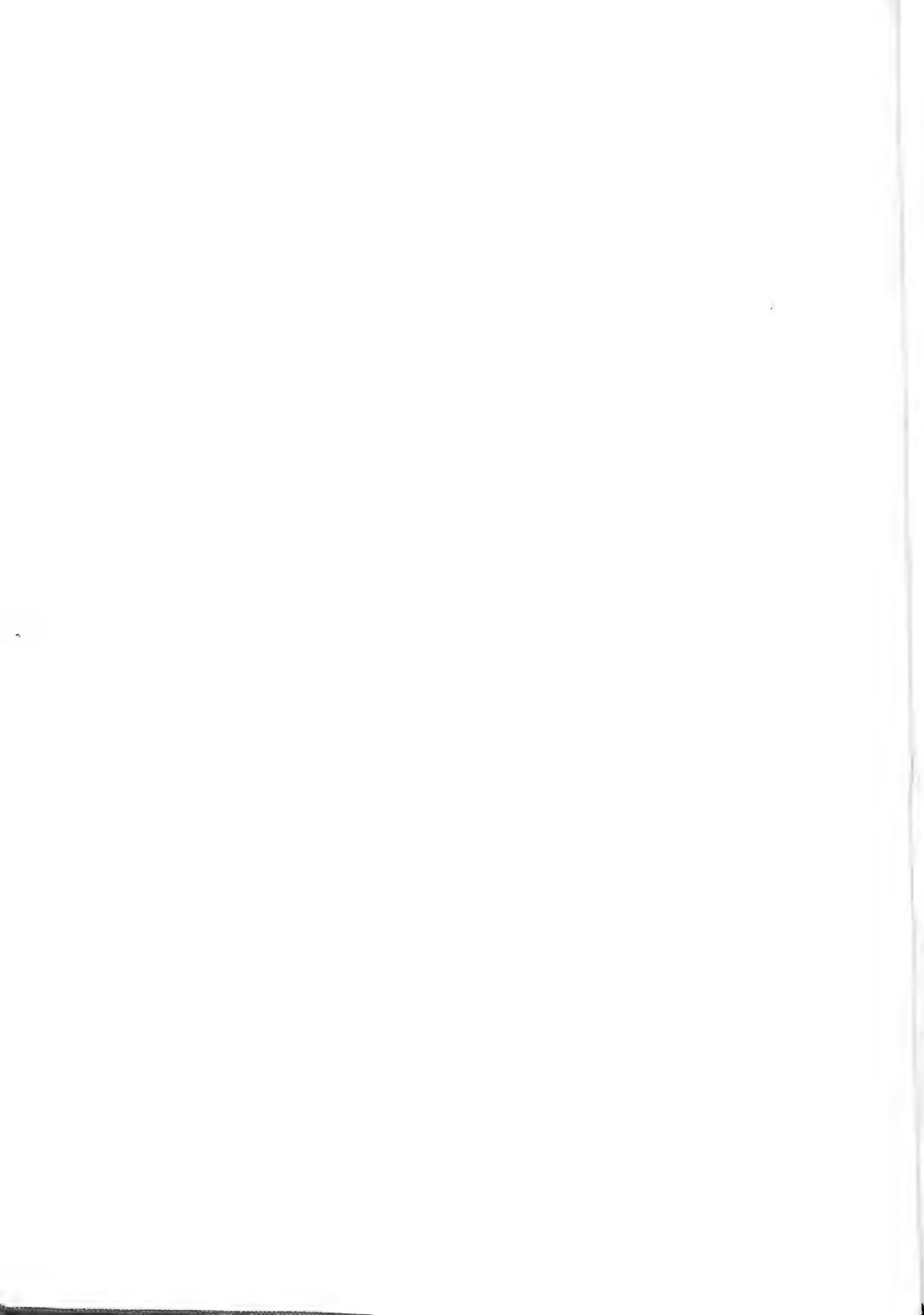
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Grahamstown.*

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STERNITES of abdomen are all, except the last, smooth in the middle and granular at the sides, the granulation being finest in the first segment. The last sternite is coarsely granular at the sides, sparsely and more finely granular in the middle, the mesial portion of the area being for the most part quite smooth: the outer keels of this sternite are granular, the inner ones smooth and almost obsolete.

TAIL. The stridulatory area of the first segment is confined to a long narrow groove, except at the posterior end where it widens out; the transverse ridges are well developed along its whole length and even in the anterior third some of them are quite continuous across the breadth of the area. In the second



Descriptions of new Arachnida from South Africa

By JOHN HEWITT.

ORDER SCORPIONES.

Parabuthus triradulatus sp. nov. (Text fig. 1.)

CARAPACE coarsely granular throughout: superciliary ridges of ocular tubercle smooth but the groove between them weakly granular.

TERGITES of abdomen finely granular in their anterior half, coarsely granular in the posterior half. The last tergite has a definite stridulatory area in the posterior half of its mesial portion where the granules are fused into transverse ridges, these ridges being longest near the hind end of the segment, some of them being almost continuous across the whole width of the area: more anteriorly the ridges become shorter and gradually break up into coarse granules. This area is rather shallowly excavated, not definitely grooved. The last tergite has no trace of a median keel.

STERNITES of abdomen are all, except the last, smooth in the middle and granular at the sides, the granulation being finest in the first segment. The last sternite is coarsely granular at the sides, sparsely and more finely granular in the middle, the mesial portion of the area being for the most part quite smooth: the outer keels of this sternite are granular, the inner ones smooth and almost obsolete.

TAIL. The stridulatory area of the first segment is confined to a long narrow groove, except at the posterior end where it widens out; the transverse ridges are well developed along its whole length and even in the anterior third some of them are quite continuous across the breadth of the area. In the second

segment the stridulatory area is similar, but the transverse ridges are stronger and fewer than in the first segment, and the area is distinctly narrower: there are about 40 rows of ridges. Inter-carinal spaces granular. Segments 1-4 with 10 granular keels each; all the median ventral keels, except the first, are granular throughout, but the anterior half of the first keel is quite smooth and that of the fourth segment is only developed in the anterior half or two-thirds of the segment. Superior keels of third and fourth segments fairly strong throughout their length, of fifth segment only strongly defined in the anterior third where there

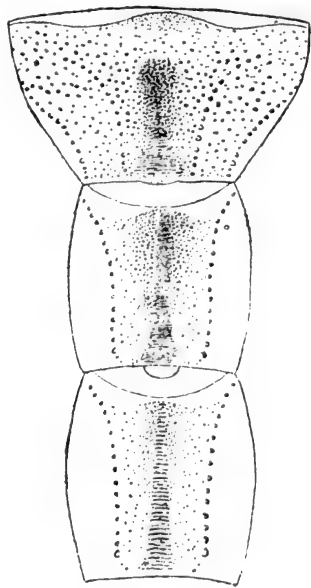


Fig. 1

Last abdominal tergite and upper surface of first two caudal segments of *Parabuthus triradulatus*, sp. nov.

are 6 or 7 strong granules which are followed by weaker granules not regularly placed but extending along the superior edge in the elevated portion of the segment and quite absent in the terminal third. Sides of segment 5 granulated but not coarsely so except to a slight extent near the upper and lower edges.

HAND about as wide as the tibia; movable finger $1\frac{2}{3}$ - $1\frac{3}{4}$ times the length of the hand back.

PECTINES. The basal lamella carries 3 teeth and is not produced inwardly to form a wide lobe.

VESICLE with a moderately deep depression at its base above, the anterior margin of the excavation being broad and rounded but not sharply defined.

COLOUR: Yellow, except for the dorsal surface of the trunk which is reddish brown; aculeus brown.

MEASUREMENTS: Total length 62 mm., length of carapace 7, of fifth caudal segment 8.

TYPE: A female specimen collected in the Transvaal, north of the Zoutpansbergen, by Messrs. Noomé and Roberts, 28.9.1913, No. 949 in the collection of the Transvaal Museum. At the same time another female was taken, slightly smaller than the type but agreeing with it in all essential respects; this is in the Albany Museum collection.

This species belongs to the group including *P. flavidus* Poc., *trunculentus* Hirst, *stridulus* Hewitt, and perhaps *mosambicensis*, Ptrs. It is distinct from any of these through the distinctly ridged stridulatory area on the last abdominal tergite.

Cheloctonus jonesi, Poc., var. nov. *sculpturalus*.

This differs from the typical form of *jonesi*, as known to me from the Zoutpansberg and Barberton districts of the Transvaal and from Zululand, as follows: legs black; hand and brachium much more coarsely sculptured above, being ornamented with thick smooth ridges forming a coarse network (in *jonesi typicus* the hands are practically smooth, and although the surface includes a network of ridges or isolated granules these are only just visible to the naked eye); humerus of pedipalp with a low but distinct superoanterior crest composed of five or six coarse granules, the upper and anterior surfaces separated by this crest being very obtusely inclined to each other. Total length 73 mm.

TYPE. A large female example, No. 608 in the Transvaal Museum collection, taken at Groenkloof, Rustenberg District (10.10.11). Besides the type, there is in the same collection a

single male specimen from Arthol (Ermelo Dist.) which is probably referable to this variety; its humerus crest is not so distinct as that of the Groenkloof specimen but not so obsolete as in the typical form of the species.

Hadogenes granulatus, Purc. (Ann. S. Af. Mus. II., p. 204).

This species, described from a single male specimen believed to have come from the Rustenberg Dist., is represented in the collection of the Transvaal Museum by two adult examples from Wankie (S. Rhodesia); it is possible that the Wankie form may be worthy of varietal rank, but very improbable that it can be specifically distinct from the type of *granulatus*.

The MALE has the following characters: Carapace as broad as long, as long as the first $+\frac{1}{5}$ of the second caudal segments, very slightly concave along its anterior margin; first caudal segment broader than high behind; vesicle coarsely granular below, 12 mm. long; tail 117 mm. long, $6\frac{2}{3}$ times the length of the carapace which is 17.75 mm. long; hands as long as the first $+\frac{1}{5}$ to $\frac{2}{5}$ of the second caudal segment.

The FEMALE has the following characters; anterior margin of carapace quite straight; carapace 20.5 mm. long, 19.5 mm. broad, as long as the first $+\frac{2}{3}$ of the second caudal segment: first caudal segment broader than high behind, the superior keels obsolete except in the first third of the segment; tail $4\frac{3}{8}$ times as long as the carapace, the first segment being 10.5 mm. long, the second 16, the third 15.75, the fourth 18, the fifth 17.5 and the vesicle 12, the total length of the tail being 89.5 mm.; vesicle coarsely granular below, very stout and large; hands very large and stout, 38 mm. long, breadth of upper surface 13 mm.

Opisthophthalmus latimanus, Koch.

This species is widely distributed in the Eastern Province of Cape Colony and has a number of fairly distinct forms. What may be called the var. *typicus* is the form described by Dr. Purcell in his important monograph of this genus (Annals South African Museum. vol. I p. 159) and is known to me from Grahamstown,

Alicedale, Redhouse, Alexandria, Queenstown and Schurfteberg (Somerset East District): in this form the hands of the male are short. The following variations may be noted:—the mesial portion of the last abdominal sternite of the male is coarsely granular in Schurfteberg specimens, only coarsely roughened in Redhouse and Alicedale examples, and merely transversely wrinkled in a yellow-legged example from Jansenville: the abdominal tergites of the female, though coarsely pitted, are usually smooth and shiny, not granulated, but in Alexandria examples they have no shiny areas and are granulated: the granulation of the upper surfaces of the caudal segments in the female varies much, the fifth caudal segment in Grahamstown examples having no granulation superiorly, except on the keels, and the third and fourth caudal segments being only slightly granulated above, but in specimens from Schurfteberg the fifth caudal segment is coarsely granulated above: the inferomedian keels of the third caudal segment may be practically smooth, or, only slightly crenulated as in Alexandria specimens, or, entirely composed of granules as in Schurfteberg specimens. The upper surface of the hand in the female is usually coarsely granular, wrinkled or tubercled, but in a Jansenville specimen is almost smooth.

From Klerksdale near Middelburg, C. P., a series of three male and two female specimens, representing a distinct variety, was presented to the Albany Museum by Mr. B. Marais. For this variety I propose the name

O. latimanus Koch var. nov. *austeroides*.

The male differs from the typical form of the species and approaches *O. austerus* Karsch in its long and slender hands, and in several other respects this form is intermediate between *austerus* and the typical variety of *latimanus*: it may be distinguished from *austerus* by the possession of fewer pectinal teeth, the terminal tooth of the superior crest in caudal segments three and four is only slightly enlarged, and the hand of the female is not quite so flat as in that species, being also slightly but distinctly broader

when compared with the length of the hand-back and of the brachium. *Austeroidea* differs from the var. *typicus* as follows :—

MALE.

The last abdominal sternite in its mesial portion is quite smooth and shining or somewhat pitted or faintly furrowed transversely but is not roughened or granulated : the inferior keels of the first caudal segment are well developed, more or less crenulated but not granular : pectinal teeth 16–18 : hand elongated. Measurements : total length 89 m.m., length of hand 25, of movable finger 17.2, of hand-back 8.5, breadth of hand 8.25, length of brachium measured along upper anterior edge 11.8.

FEMALE.

Infero-median keels of first caudal segment only very faintly crenulated, almost quite smooth except for one or two coarse pits on each keel : last abdominal sternite smooth and shining throughout, with no granulation, the lateral keels quite distinct, the surface in the neighbourhood of the keels with several coarse pits : pectinal teeth 13–14 : upper surface of hand slightly less convex and smoother than in the typical variety. Measurements : total length 90 m.m., length of hand 22, of movable finger 14.25, of hand-back 9, breadth of hand 11.

The hands in both sexes have a reddish tinge.

We also have a similar form from Herschel C. P. collected by Mr. W. J. A. Moir and presented by Rev. R. Godfrey. Our specimens of this form, a male and female, are smaller than those just described and the last abdominal sternite of the male is very finely wrinkled in its mesial portion. Pectinal teeth 16 in the male, 12–13 in the female. Measurements : total length 71 m.m. male, 74 m.m. female : length of hand 20 male, 18.5 female : of movable finger 13 male, 12.5 female : of hand-back 7 in each case : breadth of hand 7 male, 10 female.

A year ago, I received a very distinct form from Keilands and at first considered it as identical with *O. praedo*, Thor.—which was referred to the synonymy of *glabrifrons*, Pet. by Dr. Purcell. The Keilands specimens agree with *praedo* in the shape

of the hands but according to Kraepelin (Jahrb. Hamburg Wiss. Anst. XI, I, p. 107) the median groove of the first caudal segment inferiorly is quite obliterated by large granules in that species, which is not the case in the form here described. The Keilands species is without doubt most nearly allied to *latimannus* Koch and *pugnax* Thor. and in the present state of our knowledge might properly be described as a variety of either species, or even as a distinct species; however I am describing it as a variety of *latimannus* since it seems to me likely that it will prove to be linked up with the typical form of that species by intermediates.

O. latimannus Koch var. nov. *keilandsi*.

Types; one male and three female examples from Keilands near Tsomo C.P., presented to the Albany Museum by the Rev. Fr. P. Boneberg: the specimens were collected by Rev. Fr. Albert Schweiger.

MALE.

The male differs from that of var. *typicus* as follows: last abdominal sternite coarsely granular in its mesial portion (about 15-20 rows can be roughly counted between the anterior and posterior margins); infero-median keels of first caudal segment composed of about 12 or more coarse granules and the space between also has a number of similar granules but is not obliterated thereby, nor are the crests rendered indistinct: the hand is narrower and its surfaces are not coarsely granular, the upper surface being almost smooth, though covered with flat isolated granules of varying shape and size, the finger keel smooth over a great portion of its length and the secondary keels fairly distinct; on the outer surface the granules are not so flattened and the two secondary keels are composed of dark coarse granules.

FEMALE.

The female has the following characters: mesial portion of last abdominal sternite rather coarsely roughened and granulated the granules being low and flat and separated from each other (they are smaller and more numerous than in *pugnax* from Pretoria): the third to the sixth abdominal terga are not quite

smooth and shining, or only so to a slight extent, being granulated or shagreened very finely in the anterior half but coarsely in the the posterior half of each tergite ; the median longitudinal keel is much reduced being distinctly perceptible only in the middle of the segments : the median inferior keels of the first caudal segment are well developed, more or less distinctly crenulated or granulated, and in one or two places somewhat deeply pitted ; those of the third caudal segment are granular : upper surface of hand almost smooth, at any rate in the inner basal half, being covered only with low irregular flattened granules or anastomosing elevations which become coarsely and distinctly granular near the base of the immovable finger and along the inner edge of the hand ; finger keel smooth and continuous for the greater part of its length, only broken up into granules in its basal half ; outer surface of hand coarsely granular, the two accessory keels composed of still larger granules.

Pectinal teeth 16-18 in the male, 13-14 in the female.

The fingers and crests of the hands are dark, but the anterior portion of the carapace, the hands, legs and tail are yellowish.

Total length, male and female, 85 mm., length of hand, M. 21, F. 19.5 ; breadth of hand, M. 8.5, F. 11 ; length of movable finger, M. 14, F. 12.8 ; length of handback, M. 7.25, F. 7.9

Perhaps the most essential difference between this form and the typical variety of *Ialimanus* lies in the granulation of the hands.

ORDER SOLIFUGAE.

Solpuga coquinae sp. nov. (Text fig. 2).

TYPE. A single male example from Cookhouse, C.P., presented to the Albany Museum by Mr. F. W. Fitzsimons, Director of the Port Elizabeth Museum in 1911.

FLAGELLUM reaching back to a point about midway between the anterior margin of the headplate and the anterior bend of the flagellum, the anterior bend slightly posterior to the rudimentary

second tooth of the upper jaw ; recurrent portion more or less cylindrical, low-lying and lightly curved, tapering to a point. Basal enlargement longer than high, being produced anteriorly : upper margin forming a well developed keel which is raised above the exposed outer turgid portion.

UPPER JAW OF MANDIBLES. First and second teeth rudimentary, followed by a long concave toothless interval after which comes a small tooth which is confluent basally with the very large tooth which terminates the single series. The double series includes 3 inner and 4 outer teeth, the last one in each case being weakest. Terminal fang fairly strong, curved slightly outwards and its apex a little downwards : on the inner surface is a distinct curved lateral keel extending from near the anterior bend of the flagellum to a point midway between the tip of the fang and the first tooth.



Fig. 2.

Portion of left upper jaw of *Solpuga coquinae* sp. nov. viewed from inner side.

LOWER JAW with two fairly large curved teeth and a smaller one between them, nearer the hind tooth. On the outer side of the jaw is a fairly strong lateral keel extending the whole length of the jaw : it is sharp and distinct only in the distal fourth, elsewhere being roughened, granular and obtuse.

PEDIPALP. Metatarsus scopulate below except apically and in the basal fifth.

POSTERIOR LEGS with some very long hairs forming a mane.

COLOUR. Headplate and appendages pale brown, the fourth leg more deeply coloured, its metatarsus and tarsus being dark brown. Dorsal plates of abdomen brown, faintly infuscated along the midline and at the sides, the posterior plates being blackish :

sides of abdomen with white hairs. Abdominal sterna not infuscated and malleoli without blackened edges.

MEASUREMENTS. Total length 25 mm., length of tibia of pedipalp 7.4, of metatarsus and tarsus of pedipalp 7.5, of tibia of fourth leg 7, of metatarsus of same 6.4.

This species is related to *S. derbyana* Poc. and to *S. hostilis* White: it seems distinct from either in the shortness of the flagellum, but may possibly prove to be a variety of the former.

FEMALE.

A damaged female example sent from the same locality along with the male just described is no doubt referable to the same species. It agrees closely with the female of *hostilis* in colour characters and in the backward prolongation of the halves of the genital sternite. The colouration of the abdominal tergites seems to be a little different in the two species, for whilst in *hostilis* the infuscation of the posterior tergites gradually disappears anteriorly, the anterior tergites being dull brown, in *coquinae* the infuscation of the posterior tergites ends abruptly and the segments immediately preceding the blackened area are covered with golden yellow hairs.

Ceroma leppanae sp. nov. (Text fig. 3).

TYPE. A single male example from Bulawayo presented to the Albany Museum by Miss L. Leppan during October, 1913.

The species is perhaps more closely related to *C. sclateri* Purc. (Ann. S. Af. Mus. I. p. 395) than to any other described species: it differs therefrom in the greater length of the flagellum and in the form of its basal enlargement, also in the dentition.

FLAGELLUM very long, the apex reaching a short distance beyond the hind margin of the head plate. At the anterior bend it is strongly compressed laterally but at the base it is not or only very slightly enlarged: the basal end is protected by a row of feathery bristles which do not reach to the apex of the jaw. In the anterior fifth there is a thickened ridge along its length on the upper side: anteriorly this constitutes the inner edge of the groove on the supero-anterior surface of the flagellum: the greater

part of the length of the flagellum is neither grooved nor ridged, being cylindrical. At the apex it is flattened out a little and truncated.

MANDIBLES. Terminal fang of upper jaw long, gradually curving downwards a little towards the apex: cutting surface deeply grooved, the groove bounded by a sharp keel on both sides: the inner keel bears a small tooth which is very slightly anterior to the anterior bend of the flagellum. The single series includes only one other tooth, which is of moderate size and is posterior to the anterior bend of the flagellum. The double series comprises an inner row of two large pointed teeth and an outer row of five small teeth, the two rows being widely separated.

Lower jaw with a fairly large basal tooth preceded by a small one: anterior to the latter, the cutting surface of the jaw is deeply grooved and has a strong keel on either side of the groove, the outer keel being in a line with the two teeth: neither of the keels is dentated.

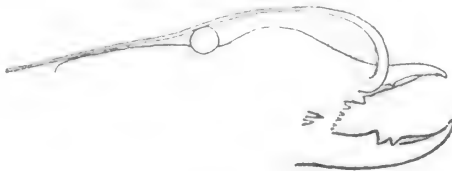


Fig. 3.

Left chelicera of *Ceroma leppanae* sp. nov. viewed from inner side.

PEDIPALP. Tarsus and metatarsus stout and straight, not curved below, the former not distinctly incrassated above: tibia with two rows of very long strong setae below, four in the posterior row and five in the anterior one, the metatarsus without such rows of setae.

LEGS. Metatarsi II. and III. with three short stout dorsal spines: tibiae II. and III. with one short apical spine above. No other spines on any of the legs. Tarsi with the terminal segment short, about equal to or even less than one third of the length of the proximal segment: the subungual appendages well developed,

about equal to or less than one half of the length of the basal joint of the claws, not attenuated at the apex, basally with a black spot.

COLOUR. Ground colour yellow with darker markings as follows:—Chelicerae with three stripes above, one lateral and two dorsal, which converge anteriorly and meet on the outer lateral surface: head plate with illdefined infuscations, mostly at the sides: ocular tubercle blackened: abdominal tergites with three longitudinal stripes, the median one continuous throughout but much attenuated in the posterior tergites, the lateral ones interrupted, broadening out in the posterior tergites: palps and legs somewhat infuscated above: malleoli not blackened. On the third and fourth post-genital sternites medially are some pinkish hairs.

MEASUREMENTS. Total length 14 mm., length of flagellum 6.3, of tibia of palp 3.8, of metatarsus and tarsus of palp 4.5, of tibia of fourth leg 5.

Hemiblossia o'neili Purc. (Annals. S. Af. Mus. Vol. 2 p. 218).
Text fig. 4.

The Albany Museum has specimens, which I refer to this species, from Alicedale (F. Cruden) and from De Aar (S. C. Cronwright-Schreiner). The flagellum in these specimens does not agree entirely with the figure given by Dr. Purcell. The accompanying figure is based on an Alicedale example.



Fig. 4.

Portion of right upper jaw of *Hemiblossia o'neili* Purc. viewed from inner side.

FAM. MIGIDAE.

Moggridgea terrestris, sp. nov.

This species is related to *M. crudeni*, Hewitt (Ann. Transvaal Mus. Vol. IV, Pt. I) in the character of the fovea; it differs from that species in the absence of distinct spinules on the coxa of the first leg and in the ocular arrangement, the anterior median and anterior lateral eyes being much more widely separated in *crudeni*, the intervening space in that species being nearly equal to or even exceeding three times the diameter of the medians. It differs from *M. rupicola*, Hewitt (Rec. Albany Museum., Vol. II, p. 462) in the character of the fovea and of the eyes.

TYPE. A single female example taken from a nest found on the open veld at Alicedale by Mr. F. Cruden, in October, 1913.

COLOUR. Cephalic portion of carapace mostly pale yellow with a brown median stripe and the anterior border broadly margined with brown: rest of carapace pale brown. Legs pale with some olive brown markings specially along the upper surfaces of the femora. Chelicerae brown. Abdomen pale with a broad purplish median area above. Lower surfaces pale.

CARAPACE longer than broad, its length equal to that of the tibia, metatarsus and two-thirds of the tarsus of the fourth leg and considerably exceeding that of the tibia, metatarsus and tarsus of the first leg. Fovea with a crescentic transverse portion, recurved at the ends, and with a very distinct broad, but short, median prolongation behind. Anterior row of eyes with its front margins forming a slightly procurved line, the lateral eyes comparatively small, the clear area about twice that of an anterior median; the distance between an anterior median and its lateral about $1\frac{1}{2}$ times the diameter of the former: anterior medians slightly more than half a diameter apart. Posterior medians and posterior laterals about of equal size, in a distinctly recurved line.

LEGS. Metatarsus IV with 3 spiniform setae in the apical tuft inferiorly. Patella III with a broad anterior band of spines and short spiniform setae as well as some long spiniform setae in one or two rows superiorly; patella IV with numerous stout

spinules on its anterior side in the basal half of the segment, these spinules becoming more setiform distally and as short stout setae extending to the distal edge of the segment. Coxae of legs II and III with a large posterior basal patch of short stout spinules; distally these spinules become somewhat setiform and more scattered, a few reaching as far as the distal end of the segment. Coxa I without distinct spinules.

PEDIPALP with numerous (about 50) spinules on the coxa inferiorly, occupying 3 or 4 irregular rows.

LABIUM with about 20 teeth.

TOTAL LENGTH 16 mm.

The lid of the nest is D-shaped and rather thick, being much thicker than in any other species known to me; there is a broad bevelled margin which, at the edges, is more or less incurved, thus overlapping the outer edge of the mouth of the tube when the lid is closed. The under surface of the lid is hollowed out in its central portion. The tube is long and the nest is thus somewhat like that of *M. mordax*, Purc. (Ann. S. Af. Mus. III, p. 70).

Moggridgea rupicoloides, sp. nov.

This species is allied to *M. rupicola*, Hewitt, from Alicedale, being distinct therefrom in the greater number of spinules on the coxae of the third and second legs, in the spinulation of the patella of the fourth leg and in the ocular arrangement, the eyes being more widely separated in *rupicola*. It is also allied to *M. terrestris*, sp. nov., but seems to be distinct therefrom in the form of the fovea, in the nature of the spinulation of the coxae of legs II and III and of the patella of the third leg, and lastly in the ocular arrangement, the anterior medians and anterior laterals being nearer together in *terrestris*.

TYPES. Nine female examples taken from nests found under the shelter of rocks and large stones on the hill overlooking the railway on the west side of the Cradock Rd., Grahamstown; collected by my wife and self, Oct. 19, 1913.

CARAPACE only very slightly longer than broad, its length equal to that of the tibia, metatarsus and half of the tarsus of the

fourth leg and considerably exceeding that of the tibia, metatarsus and tarsus of the first. Fovea strongly crescentic, with only an indication of a median prolongation behind. Anterior row of eyes with its front margins forming a procurved line, the lateral eyes comparatively small, the clear area hardly twice that of an anterior median; the distance between an anterior median and its lateral about twice the diameter of the former. Anterior medians about half a diameter apart, more or less. Posterior medians elongated and oblique, a little larger than the posterior laterals; the hind margins of the posterior row in a straight or slightly recurved line.

LEGS. Metatarsus IV with 3 spiniform setae in the apical tuft inferiorly. Patella III on its anterior side with several rows of stout spiniform setae and with a single short spine, occasionally 2 or 3, on the distal edge; patella IV with numerous stout spinules on its anterior side in the basal half of the segment, these spinules becoming more setiform distally and as short stout setae extending to the distal edge of the segment. Coxae of legs II and III with a large compact basal patch of stout spinules posteriorly; these spinules not occurring in the distal half of the segment; patch on coxa III including about 30 spinules. Coxa I without distinct spinules.

PEDIPALP with numerous (about 25-30) spinules on the coxa inferiorly, occupying 3 or 4 irregular rows.

LABIUM with about 12-15 teeth.

COLOUR. Carapace and appendages olive brown, abdomen dark above with more or less distinct darker tree pattern. Sternum pale brown with a more deeply coloured margin. Lower surface of abdomen pale.

TOTAL LENGTH 12.5 mm.

Moggridgea pymi, sp. nov.

TYPE: A single female example collected by Mr. F. A. O. Pym in Southern Rhodesia, midway between Umtali and Melsetter, about 50 miles south of Umtali; its nest was found at the foot of a baobab tree.

COLOUR : Carapace and appendages dark olive brown; distal portions of the legs paler at the joints, the tarsi reddish. Sternum and undersurface of coxae pale. Abdomen purplish above and below.

CARAPACE longer than broad. Fovea curved, with a fine median superficial groove behind. Anterior row of eyes with its front margins forming a slightly procurved line, the lateral eyes of moderate size, their area three or four times that of an anterior median and their distance from the anterior margin of the carapace rather less than their long diameter; anterior medians about a diameter apart and about two diameters, or a trifle more, distant from the anterior laterals. Posterior row of eyes in a recurved line, the medians distinctly larger than the laterals.

LEGS. Metatarsus IV with 3 spiniform setae in the apical tuft. The band of spines along the anterior surface of patella III is composed of only 8 or 9 spines which are not accompanied by a row of hairs more ventrally situated. Patella IV without spinules in its basal portion anteriorly but with a supero-anterior band of spiniform setae. Coxae II and III with a small basal patch of sharp spinules or short spines, that of III including about 7 or 8 spinules, of II about the same number but more scattered and more spiniform, the patch being not sharply separated from the few spiniform setae which occur on the posterior portion of the segment. Coxa I is without a distinct basal patch although in its posterior portion there are a few scattered spiniform setae.

PEDIPALP. On the under side of the coxa there are about 14—16 fairly strong spinules.

LABIUM with 6 strong teeth along the margin anteriorly and 11 much weaker ones posterior thereto.

TOTAL LENGTH 11 mm.

REMARKS. This species will probably prove to be near *M. whitei*, Poc. (Proc. Zool. Soc., 1897, p. 733, Pl. 42, fig. 1, 1a and 1b) from the Nyika plateau, but judging from the figures and description of that species—the spinulation of the coxae is not described in detail—the two can be separated through the ocular

arrangement at any rate, the eyes being more widely separated and more remote from the anterior margin of the carapace in *whitei*; also it may be inferred that the coxal clusters of spinules are larger in *whitei* than in *pymii*.

FAM. CTENIZIDAE.

Acanthodon spiricola, Purc.

DESCRIPTION OF MALE.

This description is based on a single male example from Kentani presented by Miss A. Pegler to the Albany Museum, along with a series of female specimens.

COLOUR: Carapace and appendages yellowish: abdomen infuscated above, paler below; sternum and coxae pale.

CARAPACE: Setiferous granules on the thoracic portion minute; on each side of the cephalic portion they are distinctly larger. Length distinctly exceeding that of the fourth metatarsus.

OCULAR AREA: Length scarcely exceeding $\frac{1}{2}$ of the distance from the front margin of the carapace to the centre of the fovea. About as wide as long. Frontal eyes distinctly separated, about $\frac{2}{3}$ of a long diameter apart. Area formed by frontal and anterior medians wider behind, its length being subequal to $1\frac{1}{2}$ times its posterior width. Medians about $\frac{1}{3}$ of a diameter apart, fairly large but not so wide as the frontals. Posterior margins of posterior row of eyes in a procurved line, the posterior medians quite two diameters apart, but less than a diameter distant from the laterals which are long and reniform.

PEDIPALP. Tibia about $1\frac{2}{3}$ times as long as deep, the excavation armed with a continuous semi-circular band of short stout spines which are several rows deep. Tarsus with 1 or 2 spines at the apex dorsally: process of bulb flattened and twisted, broadening a little near the apex.

LEGS. Tibia I slightly shorter than the metatarsus, with the usual pair of tubercles near the distal end inferiorly, the proximal one ending shortly in a subconical apex: its under surface with 4

spines along the posterior edge but none anteriorly. Metatarsus I distinctly curved near the base and with 4 posterior spines but only 1 or 0 anterior spines (excluding those at the apex). Tarsus I with 1 anterior and 2 posterior spines. All the tarsi are scopulate to the base : the fourth scopula devoid of spiniform setae. Claws of all the tarsi carrying a comb of about 5 or 6 strong teeth. Group of spinules on anterior side of patella IV reaching only about $\frac{2}{3}$ of the length of the segment. Patella III has only 10 spinules on its anterior side and none on the dorsal surface.

MEASUREMENTS. Total length 11.5 mm., length of carapace 4.75, of tibia of first leg 3.5.

Acanthodon crudeni, sp. nov.

TYPES : A series of female specimens collected at Alicedale by Mr. F. Cruden, who presented the material to the Albany Museum.

COLOR : Carapace and appendages yellowish with brown or olive tinge : lower surfaces a little paler : abdomen pale above and below with a faint purplish tinge on the median area anteriorly above.

CARAPACE as long as the patella, tibia and metatarsus of the first leg and as long as the tibia, metatarsus and $\frac{3}{4}$ of the tarsus of the fourth leg.

OCULAR AREA longer than broad and extending backwards slightly more than one third of the distance from the anterior margin of the carapace to the fovea. Area formed by the frontal and anterior median eyes wider in front, its length about $2\frac{1}{2}$ times the posterior width : the frontal eyes large, their clear areas separated by a distance equal to $\frac{1}{4}$, or sometimes almost $\frac{1}{3}$, of the long diameter of an eye, placed on a common tubercle which is shallowly grooved above anteriorly : median eyes a little less than a diameter apart. Posterior row of eyes with its posterior margins practically in a straight line, the medians separated from each other about $1\frac{2}{3}$ diameters, and from the laterals about 1 diameter or slightly more : anterior margins of the laterals about

in a line with the centres of the anterior medians or at any rate in advance of the posterior margins of the latter: area formed by the four median eyes rectangular or very slightly broader behind.

LEGS. Band of spines on anterior surface of tibia I reaching almost to the base, of tibia II including about 13 to 17 spines. Metatarsus III, with a pair of stouter spines at the apex inferiorly and two or three pairs of weaker spines on the lower surface. On distal edge of upper surface of patella III are two or three spines on the posterior side and three or four on the anterior side, the band along the anterior surface including about 10 to 20 spinules in addition to those on the distal edge. Metatarsus IV with 4 to 8 spines inferiorly, mostly on the anterior side, as well as 2 or 3 at the apex. Tibia IV with 1 spiniform seta and 1 weak spine at the apex inferiorly, also 2 or 3 weak spines along the lower surface: patella IV with a band of short stout spines along the anterior surface stretching the whole length of the segment (not quite so much in immature specimens). Coxae of legs without spinules below, the third coxa with a strip of rather fine setae along the posterior margin of its lower surface.

LABIUM with 2 to 4 apical teeth.

CHELICERÆ with an inner row of 5 or 6 strong teeth at the base of which is a short series of 3 or 4 small teeth: the basal large tooth is more internally situated than the remaining 4 or 5 which are more or less in a line with the short series of small teeth.

MEASUREMENTS. Total length 21.5, length of carapace 6.75, width of same 5, length of tibia of first leg 2.5 mm.

This species is closely related to a Grahamstown species which I suppose to be *A. flavolum* Poc. The Grahamstown species differs from *A. crudeni* as follows: the ocular area is shorter, extending backwards only one third of the distance from the anterior margin of the carapace to the fovea: the eyes are all relatively smaller, excepting perhaps in the case of the antero-medians, and the distance between the postero-medians is equal to twice the diameter of an eye; the area formed by the four median eyes is

distinctly broader behind, its length being only very slightly more than half the breadth behind whereas in *crudem* its length is about $\frac{3}{4}$ of its posterior breadth.

DESCRIPTION OF MALE.

This description is based on three specimens collected at Alicedale by Mr. F. Cruden.

COLOUR. Carapace and appendages pale yellowish brown, abdomen a little darker, lower surfaces pale.

CARAPACE slightly shorter than, equal to or even very slightly longer than the fourth metatarsus. The setiferous granules on its surface are fairly coarse on the thoracic portion as well as on the cephalic portion.

OCULAR AREA very slightly longer than $\frac{1}{3}$ of the distance from the anterior margin of the carapace to the centre of the fovea; longer than wide. Frontal eyes very close together: not $\frac{1}{6}$ of a diameter separated. Area formed by frontal and anterior medians wider behind, its length being about $1\frac{1}{2}$ — $1\frac{2}{3}$ times its posterior width, the medians about $\frac{1}{2}$ — $\frac{3}{4}$ of a diameter apart, of large size being as large as or slightly larger than the frontals. Hind margins of posterior row of eyes in a procurved line the medians from $1\frac{1}{2}$ to 2 diameters apart and about 1 diameter or less distant from the laterals which are elongated but not large.

PEDIPALP. Tibia about $1\frac{3}{4}$ times as long as deep, the band of short stout spines bordering the excavation broken a little in the middle but distally and proximally it is several rows deep, most of the distal spines being elongated. Tarsus with 4 or 5 spines at the apex dorsally, process of bulb flattened and twisted, broadening a little at the apex.

LEGS. Tibia I only very slightly shorter than the metatarsus, with the usual pair of tubercles near the distal end inferiorly, the proximal one ending shortly in a black blunt or subconical apex: its under surface with 2 spines along the median area, about 7 on or near the posterior edge, but none on the anterior edge. Metatarsus I distinctly curved near the base and with 4 or 5 posterior stout spines inferiorly but only 1 or 0 anterior stout spines

(excluding those at the apex). Tarsus I without spines on either side or with 1 on the posterior side only. All the tarsi scopulate to the base; the fourth scopula has a number of small fine spiniform setae along its length. Claws of all the tarsi carrying a comb of about 5 or 6 strong teeth, the basal ones strongest. Band of spinules on anterior side of patella IV stretching the whole length of the segment; patella III has from 13 to 20 or more spinules on its anterior side and several (5-9) along the dorsal surface.

MEASUREMENTS. Total length 14.5, length of carapace 5.8, of tibia of first leg 4.5.

Idiops arnoldi sp. nov.

TYPE. A single male specimen without precise locality data but probably from Bulawayo and certainly from S. Rhodesia: it was sent to me by Mr. G. Arnold, the Curator of the Rhodesian Museum.

COLOUR. Carapace brownish black, appendages dark chocolate, abdomen fuscous above and below except on the genital segment and opercula which are pale. Sternum brown, coxa of pedipalps and legs light brown. Spinnerets pale.

CARAPACE. Broad and depressed, its length about equal to that of the fourth metatarsus together with one third of the tarsus. The surface carries no spines nor long hairs and is only sparsely granulated.

OCULAR AREA. Length slightly less than one third of the distance from the anterior margin of the carapace to the centre of the fovea: as wide as long. Frontal eyes quite separated, about $\frac{2}{3}$ of a diameter apart. Area formed by frontal and anterior median eyes wider behind, its length being about $1\frac{1}{6}$ times its posterior width: the medians about $\frac{2}{3}$ of a diameter apart and very large being appreciably larger than the frontals. Posterior margins of posterior row in a procurved line, the medians about $2\frac{1}{2}$ diameters apart and about $\frac{1}{2}$ a diameter distant from the laterals which are elongated but not large. The posterior medians are contiguous with the anterior medians.

PEDIPALP. Tibia about $2\frac{1}{2}$ times as long as deep, the band of short stout spines bordering the excavation only present in the proximal half. Tarsus dorsally with a few scattered small weak spines but no definite group of spines at the apex (there is however a small tubercle near the apex which may be the base of a long stout spine lost in the specimen). Process of bulb very thick in its basal half, distally curved and flattened but moderately slender, drawn out to a point at the apex near which it is a little twisted.

LEGS. Tibia I shorter than the metatarsus, with the usual pair of tubercles near the distal end inferiorly, the proximal one ending in a black acuminate pointed apex, the black termination of the distal one being longer and twisted: its under surface with several long setiform spines along the median area, about 7 on or near the posterior edge and 1 or 0 on the anterior edge. Metatarsus I only slightly bowed: with 6 or 7 posterior stout spines inferiorly but no anterior stout spines (excluding those at the apex). Tarsus I with 2 or 3 spines on the anterior side and 3 on the posterior side. Tarsus I only scopulate in its distal $\frac{1}{3}$, II in its distal $\frac{2}{3}$, III and IV very broadly scopulate from apex to base, IV being very distinctly swollen and carrying 2 or 3 short spines along the length of the scopula. Claws of tarsus I carrying a comb of 5 long strong teeth occupying the whole of the basal half of the claw, of II with 4 teeth, those of III and IV are situated near the base of the claw, the hind claw of IV with either 1 or 2 teeth, the anterior claw with 3, whilst those of III may have either 4 or 3 or even only 2 (right hind claw). Band of spinules on anterior side of patella IV obsolete represented only by 4 or 5 spinules on the basal portion of the segment: patella III has 7 or 8 spinules scattered about on its anterior surface and 2 or 3 spines along the dorsal surface.

MEASUREMENTS. Total length 13.5 mm., length of carapace 5.9, of tibia of first leg 4, of first leg 23.5, of second leg 20, of third leg 19, of fourth leg 26.5, of pedipalp 11.75.

The only species of *Idiops* described from Rhodesia is *Acanthodon versicolor* Purc. (Ann. S. A. Mus. Vol. III p. 90) from

Umtali, of which only the female is known. Another species, founded on a male specimen (*I. punguensis*), was described by Dr. Purcell from the Pungwe Riv. in Trans. S. A. Phil. Soc. XV p. 116, but that species is evidently different from the one here described both in the ocular characters and in the palpal organ. It is possible that either *arnoldi* or *punguensis* may prove to be the male of *versicolor*.

Idiops pulcher, sp. nov.

TYPE. An adult female example from Tsessebe, Tati, presented to the Albany Museum by Mr. E. C. Wilmot in November, 1913. This species is related to *I. striatipes*, Purc., from Sekgoma in the Kalahari (Jenaische Denkschriften XIII, p. 206) and to *I. castaneus*, Hewitt, from Newington in the Zoutpansberg Dist. (Records Albany Museum II, p. 420), but seems distinct from both in the wide separation of the frontal eyes; nevertheless it is just possible that *pulcher* may prove to be specifically identical with either of the former species as they were both founded on immature examples.

COLOR. Carapace and proximal segments of appendages yellowish, in places faintly streaked with red. Ocular area infuscated, also the anterior margin of the carapace for a short distance. Chelicerae reddish above. Patellae of palp and of first two pairs of legs pale reddish brown above, darker at the sides; the more distal segments of these appendages are dark brown above. In the third and fourth legs, only the tarsi are dark brown. Abdomen pale above and below.

OCULAR AREA about as long as one third of the distance from the anterior margin of the carapace to the centre of the fovea, broader than long, its width less than the length of metatarsus I. Area formed by the frontal and anterior median eyes parallel sided, about $1\frac{2}{3}$ times as long as broad. Frontal eyes large, about $\frac{2}{3}$ of a diameter apart, the common tubercle grooved above. Posterior lateral eyes long, subreniform, their anterior margins about in a line with the posterior margins of the anterior medians and their posterior margins a little posterior to a line joining the posterior

medians. The four median eyes form an area which is appreciably broader behind than in front and very much broader than long (but not twice as broad as long), the anterior medians about $1\frac{1}{3}$ diameters apart, very much larger than the posterior medians which are oval and distant from each other about $\frac{1}{2}$ further than from the lateral eyes.

LEGS. Coxae without spinules. Tibia I about equal in length to the metatarsus and $\frac{2}{3}$ of the tarsus. Tibia II on its anterior side with a row of 5 spines, the posterior surface without spines except a few long ones ventrally situated. Tibia IV with a single short spine on the middle of its anterior surface, or none at all. Patella III with a single apical spine overhanging the upper posterior part of the distal edge, but the middle of the posterior surface is free of spines. Patella IV with a patch of spinules on its anterior surface stretching from base to apex. All the tarsi spined below.

LABIUM with 6 strong apical teeth, behind which are several weaker ones.

CHELICERAE. Fang serrated inferiorly, but not in the apical sixth.

MEASUREMENTS. Total length 33.3 mm., length of carapace 13.5, of metatarsus of first leg 4.3, of metatarsus of fourth leg 6.3.

Stasinopus maraisi, sp. nov. (Text fig. 5).

This species is closely related to *S. leipoldti*, Purc. (Trans. S. Af. Phil. Soc. XI, p. 348) and to *S. schreineri*, Purc. (Annals S. Af. Mus. III, p. 19) differing from both principally in the eye characters. The small size of the posterior lateral eyes is perhaps the most striking feature of the species. From *schreineri* it may also be distinguished by the spinulation of the tarsus of the pedipalp and of the patella of the third leg; from *leipoldti* in the transverse row of setae on the metatarsus of the fourth leg and in the spinulation of the metatarsus of the third leg. This species may possibly prove to be the same as *S. palpiger*, Poc. (Ann. Mag. Nat. Hist. 7 X, 9) from Graaff Reinet, but it seems more likely that *schreineri* may be identical with that species; at any rate, *schreineri*, which

was described from Hanover, also occurs at Perseverance (Mrs. T. V. Paterson) and at Schurftberg, Somerset East Dist. (Mr. B. Marais).

TYPES. Description drawn up from a series of adult female specimens collected at Victoria West and at the farm Driefontein, twelve miles from Victoria West, by Mr. B. Marais, who presented the material to the Albany Museum (1912—1913).

COLOUR. Carapace and appendages pale brown above, the chelicerae rather more deeply coloured; abdomen pale above with some dark blotches which in the hinder half are symmetrically arranged, forming a kind of tree pattern. Ventral surfaces pale, the labium and coxae of the pedipalps being more deeply coloured.



Fig. 5.

Ocular area of *Stasimopus maraisi* sp. nov.

CARAPACE. Length about equal to, or a little less than, that of the patella, tibia, and metatarsus of the first leg. Ocular area rather wide, its width behind equalling the metatarsus together with about $\frac{1}{3}$ of the tarsus of the first leg, appreciably less than the fourth metatarsus. Eyes of anterior row about equally spaced, the medians perhaps a trifle nearer to the laterals than to each other, the anterolaterals large; breadth of anterior row slightly greater than distance between outer margins of the posterior medians; posterior medians rounded or oval always larger than the posterior laterals, often very much so; distance between posterior medians and posterior laterals usually less than or occasionally subequal to the diameter of the former; distance between the anterior laterals and posterior laterals about equal to or slightly greater than one and a half times the long diameter of the former; distance between anterior laterals and posterior medians very slightly greater than the long diameter of the former. Posterior row of eyes recurved sometimes only slightly so.

PEDIPALPS. The inner side of the tarsus with 6 or 7 longish spines in its distal half, the inner side of the tibia with a single one near the apex and sometimes also a weaker one at the base; the tarsus superiorly with a small patch of sharp spinules at the base and usually there are several such spinules at the apex of the tibia, sometimes however only 1 or none.

LEGS. Tibia I very slightly shorter than the metatarsus and very distinctly shorter than the width of the posterior row of eyes, a strip of from 8 to 13 spines along the inner surface; metatarsus with a basal patch of spinules superiorly, occupying from $\frac{1}{6}$ to $\frac{1}{4}$ or even more of the length of the upper side, the tibia with a smaller distal patch above occupying about $\frac{1}{7}$ or less of the length of that segment. Basal patch of spinules on metatarsus II above longer than the distal patch on the tibia. Metatarsus III without apical spines inferiorly, with a strip of about 20 dark stout spinules along the anterior surface and a similar strip of about the same number along the posterior surface; tibia with a distal patch of red spinules above extending over about $\frac{1}{2}$ its dorsal length; patella with no short red spinules nor distinct spines at the apex above, but with about 11 to 14 stout spinules on the anterior surface. Metatarsus IV with an infero-posterior transverse row of 2, 3 or 4 setae, without spines on the inferior surface; patch of red spinules on anterior part of patella about half the length of the segment sometimes extending a little further but not approaching the distal margin.

LABIUM with from 3 to 6 apical teeth.

MEASUREMENTS. Total length 32.5, length of carapace 10.5, breadth of carapace 9, length of metatarsus of first leg 4.

Stasinopus schönlandi, Poc. var. nov. *spinosus*.

TYPE: a single adult female from Annshaw, Middledrift, C.P., collected for, and presented to, the Albany Museum by Mr. F. Salisbury.

DESCRIPTION: This variety closely resembles the typical form of *schönlandi* from Grahamstown in its ocular arrangement, although the distance between the lateral eyes on each side is hardly twice as long as the length of a posterior lateral. It differs

in the following respects : basal patch of spinules on upper surface of metatarsus of first leg about equalling one half of the length of the segment, the apical patch on the tibia quite two-fifths of the length of the tibia : basal patch on metatarsus of second leg almost equalling one-third of the length of the segment, the apical patch on the tibia about half the length of the tibia : near the distal edge of the posterior lateral surface of the third patella there is a band of short stout dark spinules (including approximately ten or twelve) which is continuous with the band of weaker reddish spinules on the distal edge superiorly : there are numerous (27-34) spinules along the posterior surface of the third metatarsus : a group of short but strong spines at the apex of the third metatarsus inferiorly. Total length 34 mm.

To this form must be referred an example from Debe Nek and one without precise locality data in the Kingwilliamstown Museum, specimens which were mentioned in my notes on *schönlandi* in Records Albany Museum II p. 406.

Stasinopus schönlandi, Poc.

DESCRIPTION OF MALE.

Two male specimens were found by myself in Grahamstown on May 25th and 29th of 1913 : in each case the creature was found slowly walking about on the open veld.

COLOUR. Upper surfaces black, except the tarsi and metatarsi of the legs, and tibia and tarsi of the pedipalp, which are red : lower surfaces also fuscous but the lung opercula and genital segment are yellowish : the spinnerets are pale above and below.

CARAPACE a trifle longer than the metatarsus of the fourth leg. The three keels on the anterior portion are flattened, the median one being scarcely, if at all, raised above the surrounding surface : hairs are absent therefrom and from the ocular area. Ocular area on the whole resembling that of the female : anterior margins of anterior row in a straight or slightly recurved line : distance between an anterior lateral and anterior median slightly greater than or equal to the long diameter of the former, and only very slightly less than,

or subequal to, the distance between an anterior and posterior lateral.

PEDIPALPS. Stretched forwards, the apex reaches as far as the basal fifth of the metatarsus of the first leg. Patella short, very slightly shorter than patella of first leg. Tibia and tarsus together much shorter than the carapace. Process of palpal organ long and tapering but not very slender, curved in its basal half but almost straight distally.

LEGS. All the tarsi scopulate below but no trace of scopula on the metatarsi. Tarsus I not distinctly swollen below, with 7 or 8 short spines on both anterior and posterior sides (but in one case there are only 3 on the anterior side). Metatarsus I with strong spines below both over the median area and at the sides. Tibia I shorter than the metatarsus, thickly spined below. Patella I with 1 or several strong spines inferiorly on or near the apex as well as some spiniform setae. Tarsus II with 12—14 short spines on its posterior side and with a number on the anterior side (4 in one case, 9 in the other). Tarsus III with about a dozen posterior spines and about the same number of somewhat weaker spines on the anterior side. Tibia III with a patch of spines and spinules on or near the distal edge on both anterior and posterior sides superiorly; patella with an anterior band of spines but with no distal patch of spinules above, except those on the anterior edge belonging to the anterior band. Tarsus IV with many spines on the anterior side and about 8 or 12 somewhat weaker ones on the posterior side; patella IV with a patch of minute spines extending over about $\frac{1}{2}$ — $\frac{2}{3}$ of the length of the anterior side.

MEASUREMENTS. Total length 18 mm., length of carapace 6.6, of pedipalp 16.3, of first leg 24, of second leg 22.5, of third leg 19.5, of fourth leg 26.5.

Stasimopus astutus Poc.

DESCRIPTION OF MALE.

This account is based on a single male example from Bedford, C.P., presented to the Albany Museum by the Sisters of the Bedford Convent: the specimen was sent along with several female

examples which agree closely with Pocock's original description of the species.

COLOUR. Carapace, chelicerae, pedipalps and first two pairs of legs dark brown, the distal half of the tibia of the pedipalps pale yellowish, and the tarsi and tips of the metatarsi of the legs pale : third and fourth legs brown. Abdomen dull brown above. Sternum and under surfaces of coxae of legs and of third and fourth femora pale.

CARAPACE. Equal to the fourth metatarsus in length. The three keels on the anterior portion fairly sharp, carrying long hairs which also occur on the ocular area. Anterior margins of front row of eyes in a slightly procurved line : distance between an anterior median and anterior lateral about $\frac{2}{3}$ of the long diameter of the latter, but distance between an anterior lateral and a posterior lateral equal to about $1\frac{1}{2}$ — $1\frac{2}{3}$ times the long diameter of the former.

PEDIPALP. Stretched forwards, the apex reaches as far as the basal fifth of the metatarsus of the first leg. Patella short, subequal to that of the first leg : tibia and tarsus together much shorter than the carapace. Process of palpal organ long tapering and very slender, curved throughout its length.

LEGS. All the tarsi scopulate below : a weak but distinct scopula also at the apex of the first and second metatarsi. Tarsus I only slightly swollen below, with 1 spine on its anterior side and 2 on the posterior side. Metatarsus I with strong spines at the sides but not along the median area inferiorly. Tibia I with some very strong spines below and at the sides, shorter than the metatarsus. Patella I with 1 spine near the apex inferiorly as well as some scattered curved spiniform setae. Tarsus II with 2 spines on the anterior side and 6 on the posterior side. Tarsus III with 7—11 posterior spines and 4—6 anterior ones : tibia III with some short strong spines and spinules on or near the distal edge on both anterior and posterior sides superiorly : patella with an anterior row of spines but with no distal patch of spinules above, except several spines on the anterior edge terminating the anterior band. Tarsus IV with many spines on the anterior side and 7 on

the posterior side; patella IV with a patch of minute spines extending over about $\frac{1}{2}$ of the length of the anterior side.

MEASUREMENTS. Total length 15 mm., length of carapace 6 mm., of palp 16.5, of first leg 24.5, of second leg 22, of third leg 18, of fourth leg 24.8.

Stasimopus palersonae, Hewitt. (Records Albany Mus. II, p. 408.)

Adult examples of this species from Perseverance and Red-house have stout spines at the apex of the third metatarsus inferiorly. It is chiefly distinguished from *astulus*, Poc., however, in that the distance between the anterior lateral and anterior median eyes is greater than the diameter of the medians. At Alicedale, Mr. Cruden has collected several female and male examples of a *Stasimopus* which I refer to this species although when typical males from Perseverance are known it may be necessary to assign varietal rank to the Alicedale form. The following notes refer to this form:

MALE: Closely resembling the male of *astulus* from Bedford, but slightly smaller and differing as follows: Tarsi I and II more distinctly swollen and relatively a little shorter. Tarsus I either quite without spines or with one on each side. Tarsus II with 1 or 2 anterior and 2 posterior spines. Tarsus III with 4 or 5 anterior spines and 5 or 6 posterior ones. Metatarsi I and II without distinct scopulae at apex though a few scopular hairs occur there. Stretched forwards the pedipalp barely surpasses the apex of tibia I. Anterior row of eyes rather more distinctly procurved. Distance between anterior laterals and anterior medians half or very slightly more than half the long diameter of the former. Total length 14 mm.

FEMALE. Distance between the two lateral eyes on each side scarcely greater than the diameter of the posterior lateral or even as much as $1\frac{2}{3}$ times that length; distance between anterior medians and anterior laterals subequal to or slightly greater than the long diameter of the latter but $1\frac{1}{2}$ — $1\frac{3}{4}$ times the diameter of the medians. At the apex of metatarsus III inferiorly there are a few distinct spines or long and rather slender spiniform setae or

none at all. Basal patch of spinules on upper surface of metatarsus I extending about $\frac{1}{2}$ more or less, of the length of the segment. Total length 32 mm.

Description based on several female examples and two males collected by Mr. F. Cruden at Alicedale.

Stasimopus qumbu, Hewitt (Records Albany Mus., Vol. II, p. 407).

DESCRIPTION OF MALE.

This account is based on a single specimen recently sent to me from Shawbury, Qumbu, by Miss J. Hoodless.

COLOUR. Blackish above, the tarsi of the legs dark brown; sternum castaneous, lung opercula, genital sternite and spinnerets pale.

CARAPACE a trifle longer than metatarsus IV. The three keels on the anterior portion are depressed but strongly and numerous ridged transversely; the lateral keels are very broad. No stout hairs on the keels nor on the ocular area. Anterior margins of anterior row of eyes in a slightly procurved line; distance between an anterior lateral and anterior median very slightly less than the diameter of a median, appreciably less than the long diameter of the lateral which is subequal to the distance between an anterior and posterior lateral.

PEDIPALPS. Stretched forwards, the apex reaches to a point about $\frac{2}{3}$ of the distance along the length of the tibia of the first leg. Patella short, appreciably shorter than that of the first leg. Tibia and tarsus together much shorter than the carapace. Process of palpal organ long, tapering and slender, lightly curved in its distal half.

LEGS. All the tarsi scopulate below, and a few scopular hairs occur near the apex of the first metatarsus. Tarsus I only very slightly swollen below, with 10 or 12 spines on both anterior and posterior sides. Metatarsus I with strong spines below both over the median area and at the sides. Tibia I shorter than the metatarsus, thickly spined below. Patella I with 2 or 3 strong spines at the apex inferiorly. Tarsus II with 10 or 12 spines on each

side, III with about 10 somewhat weaker spines on each side. Tibia III with a dense patch of short spinules at the apex above, a number of stouter spinules on the posterior surface apically and others on the anterior side but the anterior patch is completely continuous with the mid-dorsal patch; patella with about 7 short spines at the apex on its anterior side and about the same number of weak spines form a broken band along the anterior surface. Tarsus IV with many spines on the anterior side and about 13 on the posterior side; patella with a patch of minute spines extending over about $\frac{2}{3}$ of the length of the anterior side.

MEASUREMENTS. Total length 16.2, length of carapace 7 mm.

Stasimopus erythrognathus Purcell. (Ann. S. Af. Mus. III p. 73.)

The Albany Museum has a series of female specimens and one male from Worcester, presented by Mr. G. B. Townshend. The females agree with the original description in all essentials, differing however in that the apical patch of spinules on the dorsal surface of tibia I, in some cases, only extends over $\frac{1}{3}$ or even $\frac{1}{6}$ of the dorsal length of the segment.

DESCRIPTION OF MALE.

COLOUR. Carapace and appendages brown, without infuscation except to a slight extent on the ocular area: tibia of pedipalps pale. Abdomen dark above, pale below. Coxae of pedipalps and first two pairs of legs inferiorly castaneous: otherwise the legs are brown below like the sternum.

CARAPACE very slightly shorter than metatarsus IV. The three keels which in this genus are normally present on the anterior portion of the carapace are here obsolete owing to flattening and sculpturing of the surface: the median keel however is distinguishable in its posterior portion. No stout hairs on the anterior portion of the carapace. Anterior margins of anterior row of eyes in a procurved line: distance between an anterior lateral and anterior median about half the diameter of a median, that between an anterior and posterior lateral only very slightly less than the long diameter of the anterior lateral.

PEDIPALPS. Stretched forwards the apex reaches to a point about $\frac{3}{4}$ of the distance along the length of tibia I. Patella short, about as long as that of the first leg. Tibia and tarsus together shorter than the carapace. Process of palpal organ tapering and slender, curved in its distal half.

LEGS. All the tarsi scopulate below, and a small scopula occurs near the apex of the first and second metatarsi. Tarsus I only very slightly swollen below, with a single short spine on the posterior side but none anteriorly. Metatarsus I with strong spines at the side and below but along the midline such spines do not occur. Tibia I shorter than the metatarsus, with strong spines below except in the basal third or fourth. Patella I with a single rather weak spine at the apex inferiorly. Tarsus II with a single short spine on the anterior side and 1 or 3 posteriorly, III with only 1 short spine on each side. Tibia III with a cluster of 3—5 stout spinules at its apex on the anterior side and a similar cluster on the posterior side. Patella III with 1 or 2 short spines at the apex on its anterior side but instead of a band of spines along the anterior surface there is only 1 other spine. Tarsus IV with about 10 spines on its anterior side and 2 posteriorly: patella with a patch of minute spines extending over about $\frac{1}{2}$ of the length of the anterior side.

MEASUREMENTS. Total length 16 mm., length of carapace 6 mm.

Pelmatorycter magnisigillata, sp. nov.

TYPE. A single female specimen from Kokstad, C.P., presented to the Albany Museum by Sister Stephany of the Kokstad Convent.

COLOUR. Carapace and proximal segments of appendages dark chestnut brown, the more distal segments of the legs paler, especially the patella and tibia of the palp, and the patellae, tibiae and metatarsi of the first two pairs of legs; lower surfaces brown, abdomen infuscated above and below.

OCULAR AREA a little more than twice as broad as long; the anterior row subequal to the posterior row in width, the eyes

equidistant, rather more than a diameter of a median apart, the anterior margin strongly procurved, the posterior margin only very slightly procurved, the laterals very large, the medians situated on a tubercle; posterior row with its posterior margins in a strongly recurved line, its anterior margins in a less recurved line, the medians somewhat elongated slightly nearer to the laterals than to the anterior medians, the laterals distinctly longer and considerably larger than the medians, very much smaller than the anterior laterals, the distance between the laterals being only very slightly less than the long diameter of the posterior one.

LEGS. Tarsi and metatarsi of first two pairs of legs thickly scopulate to the base (on the second metatarsus the scopula is absent on the outer side of the midline in its basal third). Tarsus I and II with a single short spine distally on the outer side; III with 2 spines distally below, and in its distal half dorsally with 2 spines on each side; IV strongly aculeate on the anterior side in its distal half. Metatarsus I and II with 3 apical spines below and 2 along the inferior surface; III numerous spined on both outer and inner surfaces above and with several pairs of long spines below; IV with 2 spines on the dorsal surface posteriorly, with a number (12) of spines along the anterior surface inferiorly and on the lower surface distally as well as 3 at the apex. Tibia I and II each with a strong apical spine below; III and IV with a pair of apical spines inferiorly, III also with a supero-anterior band of 7 spines, 3 dorsal spines and 3 near the supero-posterior edge in its distal half, IV also with 2 pairs of long spiniform setae on the lower surface but without spines on the lateral surfaces. Patella III covered with short stout spines on the anterior surface, the dorsal surface with 2 spines on its posterior edge, IV with some short sharp spinules on the anterior side in its basal half. Femur IV with a dense group of short strong spines at the apex above and anteriorly. Claws of anterior legs with 5 or 6 teeth in each row, those of the fourth legs with only 3 teeth in each row.

PEDIPALPS with 4 apical spines below on the tibia, the tarsus with 2 shorter spines nearer the apex inferiorly and a longer one

on each side nearer the base; coxae entirely without spines or spinules.

POSTERIOR STERNAL SIGILLA very large, pearshaped but curved, approaching very near to the midline, their distance apart about equal to $\frac{1}{5}$ — $\frac{1}{6}$ of the length of either or to $\frac{1}{2}$ of the distance of either from the lateral margin of the sternum.

POSTERIOR SPINNERS. Apical segment scarcely exceeding the penultimate segment in length.

MEASUREMENTS. Total length (including spinners) 25.6 mm., length of carapace 8.2, width of carapace 6.2.

The most distinguishing character of this species apparently is the close approximation and large size of the posterior sternal sigilla.

FAM. ZODARIIDAE

Cydrela friedlanderac sp. nov. (Text figs. 6, 7 and 8).

TYPE. A single adult female specimen from De Aar, presented to the Albany Museum by Mr. S. C. Cronwright-Schreiner in Feb. 1913. The species is named after Miss Ethel Friedlander, to whom also the Museum is indebted for Arachnid material from De Aar.

COLOUR. Carapace, pedipalpi and proximal portions of legs black, the tarsi and metatarsi rufescent. Sternum reddish brown. Abdomen black above and below, with some bright yellow markings above viz.—posteriorly a large yellow median spot, laterally at about the middle of the length of the abdomen a fairly large yellow spot, anteriorly a more or less distinct narrow transverse yellow stripe. In a young specimen from the same locality and collected at the same time the anterior transverse stripe on the abdomen is connected laterally with the lateral spot on either side; its carapace is reddish brown.

EYES. Anterior median eyes largest, slightly more than half a diameter apart. Posterior medians about $1\frac{1}{2}$ diameters apart. Posterior row of eyes distinctly procurved, distance between

posterior medians and posterior laterals about $3\frac{1}{2}$ times as much as that between the two posterior medians. Distance between the two anterior laterals about $1\frac{1}{3}$ — $1\frac{1}{2}$ times that between the anterior lateral and anterior median of same side. The clypeus is high, the distance between the anterior laterals and the anterior margin of the carapace being appreciably greater than that between the posterior medians and the anterior laterals. Clypeus and ocular area bearing a number of long and moderate sized black bristles.

LEGS. Tarsus of the fourth leg just half the length of the metatarsus. On the upper surface of patella III both anteriorly and posteriorly are a number (a dozen or more) of short black spines arranged in several rows and on patella IV the anterior patch includes about 24 spines and the posterior one about 18. On the anterior surface of tibia II is a row of 3 or 4 spines but none on the upper surface, on anterior surface of tibia III are 7 or 8 spines and on the posterior side of the dorsal surface is a double row including about 10 or 11 spines: the fourth tibia is similarly spined but the double row on the posterior side of the dorsal surface includes about 14 spines.

MEASUREMENTS. Total length 13 mm., length of carapace 6.25 mm., of first leg 16, of second leg 15, of third leg 15.5, of fourth leg 19.5.

The height of the clypeus and the procurved posterior row of eyes distinguish this from any other described species of *Cydrela*.

NEST. This species is remarkable from the fact that the entrance to its tubular retreat in the ground is guarded by a perfect trap door. The lid is circular in outline and very thick with a strongly bevelled margin all round permitting it to fit tightly like a cork into the mouth of the tube. Vegetable stalks and fibres enter largely into the composition of the lid which, when closed, must be very effectively concealed in its natural environment owing to the presence of these projecting stalks. The hinge is not so wide as the diameter of the lid and is very delicate. The diameter of the lid, measured across its upper surface is 12.5 mm.

The habit of making trap-doors has been previously recorded by Dr. Purcell (in 'Science in S. Africa') for this family but so far as

I know the actual species concerned has not been named or identified.

It is of interest to note that two-lunged spiders of trap-door making habits are ornamented with bright colours like their allies of normal habits, whereas the Ctenizidae (female) never have bright colour patterns. It is probable that such two-lunged spiders do not remain within the nest indefinitely, as do the Ctenizidae at any rate during daytime: according to Mr. Cronwright-Schreiner, *Lycosa domicola*, a very handsome spider of trap-door making habits, often leaves its nest during the day.

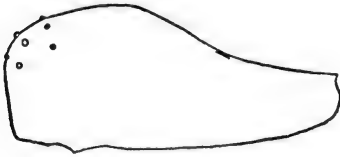


FIG. 6.

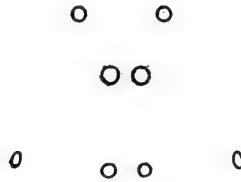


FIG. 7.

Cydrela friedlanderae, sp. nov. Carapace in side view (6); Ocular area seen from above (7).

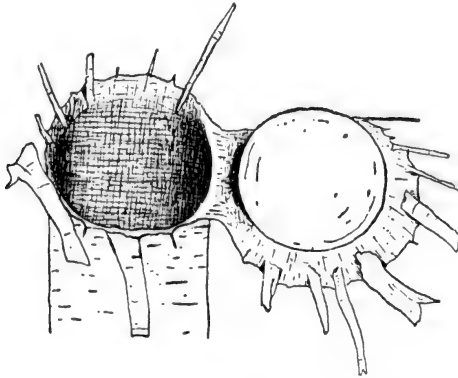


FIG. 8.

Cydrela friedlanderae, sp. nov. Trapdoor and portion of nest removed from ground.

**Cretaceous Fossils from the Bethelsdorp Salt Pans,
South Africa, belonging to the Albany Museum.**

By R. BULLEN NEWTON.

Among the Kainozoic Mollusca sent to the British Museum for determination by the Albany Museum of South Africa, were a few specimens from the Bethelsdorp Salt Pans, situated in the Zwartkops River Valley, which belong to the Cretaceous formation known as the Uitenhage Series, and consequently may be regarded as of Neocomian age. The determinations of these specimens are as follows :—

PELECYPODA	<i>Exogyra (Jonesi) jonesiana</i> , Tate.
	<i>Anomia</i> (indeterminable).
ECHINOIDEA	<i>Cidaris pustulifera</i> , Tate.
	(<i>C. africana</i> , Rubidge, MS.)

REMARKS : Fossils were first described from this area by Ralph Tate (*Quart. Journ. Geol. Soc.* 1867, Vol 23), that had been collected by Dr. Rubidge, the types of which are in the British Museum (Geological Society Collection). Tate referred to these beds on p. 152 of his memoir as representing a "sandy shell-band with *Ostrea*, *Astarte*, &c." He further regarded them as belonging to the "lowest strata of the Zwartkop Crags" (see D. Sharpe : *Trans. Geol. Soc. London*, 1856, Ser. 2, Vol. 7, p. 203), and of Jurassic age. The Bethelsdorp Salt Pan deposits were subsequently studied by G. W. Stow (*Quart. Journ. Geol. Soc.* 1871, Vol. 27, pp. 506—514), who mentioned that the characteristic fossil was *Cidaris pustulifera*, consisting of fragmentary spines and plates, and that this Echinoid was associated with *Ostrea jonesiana*, and

*Crassatella complicata** (collected by Dr. Rubidge). Stow hesitated to regard these beds as occurring below the *Trigonia* and *Ammonites* of the Uitenhage formation, as he had failed to see any sections to prove such a position; but he followed Tate in recognising the Uitenhage beds as of Jurassic age. At a later date it was suggested by Prof. E. H. L. Schwarz that the Bethelsdorp deposits might belong to the "Alexandria Formation" which that author had recognised as equivalent to the uppermost Cretaceous or Danian of European nomenclature (*Trans. Geo. Soc., South Africa*, 1908, Vol. 11, p. 108). From the species quoted by Stow, however, as typical of these beds, it must be remembered that Tate's *Crassatella complicata* was included, a species originally described from the rocks of Sunday's River and Prince Alfred's Rest (or McLoughlin's Bluff), near the mouth of the Sunday's River, which are regarded as of Neocomian age: it follows, therefore, that the Bethelsdorp Salt Pan beds should be referred to a similar geological horizon.

*Since determined as belonging to the genus *Ptychomya*.

Notes on the Genus *Greyia*, Hook et Harv.

(with one plate and four figures in the text).

By S. SCHÖNLAND.

The genus *Greyia*, named in honour of Sir George Grey, K.C.B., has a very limited distribution. It occurs on the Drakensberg range extending westwards to Griqualand East (*Gr. Sutherlandi*) and the Kei river valley near Komgha (*Gr. Flanaganii*). Its eastern limit seems to be the neighbourhood of Barberton (*Gr. Radlkoferi*). Its isolated geographical position is to a certain extent paralleled by its isolated position in a natural system of classification which has led various botanists to different conclusions. Harvey (Thes. Cap. I, 1) did not express a decided opinion on its exact natural affinities and placed it provisionally amongst *Saxifragaceae*, at the end of which he dealt with it in the *Flora Capensis* (II, 308). He pointed out that in some respects it agrees with the genus *Brevia*. In deference to the opinion of the late Sir Joseph Hooker he placed it in the 2nd edition of the "Genera of South African Plants" after the *Meliantheae* (—then considered a tribe of *Sapindaceae*—) but still looked upon it as a genus of uncertain affinity. Sir Joseph Hooker dealt with the matter in an article which was published in the *Journal of Botany* (XI, 1873, 356) and in which he gave full reasons in support of his view. This view is to a certain extent shared by Gürke (*Natürl. Pflanzenfamilien* III, 5, 379). This author (like some others before him) separated, however, the 3 genera *Bersama*, *Melanthus* and *Greyia* as an order, the *Melanthaceae*, and divided it into two tribes *Meliantheae* and *Greyiaceae*, thus giving expression

to the fact that after all the affinity of *Greyia* with the other two genera is not a very close one and he says even "it appears questionable whether it would not be better to make *Greyia* the type of a new Natural Order." The only alternative is the course which he has taken. He states very concisely (l.c. 379) the points of affinity with and the points of difference from the 2 other genera constituting the *Melanthaceae*. During comparatively recent years only Baillon has accepted Harvey's original suggestion of placing *Greyia* amongst *Saxifragaceae*. I have tried in vain to get beyond the position taken up by Gürke, but in view of the interest attached to the genus I publish the following brief notes, especially as two of the three known species of *Greyia* were described in publications not readily accessible to many botanists in South Africa. As the published general descriptions of the genus are, in a few particulars, not quite accurate, I have also drawn up an amended diagnosis of it.

GREYIA, Hook et Harv. Mss.—Harv. in Proc. Dubl. Univ. Zool. and Bot. Association, Vol. I, 138, t. 13, 14 (charact. emendat.).

Arbores mediocres vel frutices, foliis alternis laminis subrotundatis pedatinerviis simplicibus crenato-lobatis exstipulatis petiolatis, petiolo basi dilatato. Inflorescentiae terminales racemosae pedunculatae bracteis parvis lanceolatis, floribus speciosis-simis subzygomorphae. Calyx quinquepartitus brevis persistens laciniis aestivatione imbricata. Petala 5, decidua aestivatione imbricata margine tenuiter ciliata. Stamina 10 in fundo calycis inserta subhypogyna biseriata libera exserta filamentis subulatis antheris ovatis brevibus didymis longitudinaliter dehiscentibus. Discus carnosus extra-staminalis cupularis 10—lobus basi stamina cingens ovario junctus lobis cum staminibus alternantibus glandula magna instructis. Ovarium oblongum profunde 5-sulcum 5-loculare, placentis axilibus multiovulatis, apice in stilo attenuatum. Stilus gracilis subulatus. Capsula follicularis versus apicem septicida chartacea. Semina minuta, testa membranacea, albumine copioso carnosio, embryonis orthotropi radícula hilo proxima.

There are three species described :

1. *Gr. Sutherlandi* Hook et Harv. Mss.—Harvey in Proc. of the Dublin University Zoological and Botanical Association I, part 2, 138, t. 13, 14.—Harvey, Thes. Cap. I, plate 1.—Harvey in Harvey and Sonder, Flora Capensis II, 308.—Bot. Mag. t. 6040—Gürke in "Engler und Prantl Natürl. Pflanzenfamilien" III, 5, 382—Sim, Forest Flora (1907) 165.

Racemes dense, many flowered. Pedicels about 18 mm. long. Petals about 11 mm. long. Stamens more than twice the length of the petals. Lobes of disk with glandular portion peltate, oval or subrotund.

Specimens in Herb. Alb. Mus.: Port Natal, Sutherland; grown in Cape Town, Oct. 1912, Mrs. Bolus; Bester's Vlei, Harrismith, O.F.S., Bolus 8137, and Flanagan 2071; Van Reenens Pass, Drakensberg, Nov. 1892, J. M. Wood, 4691; Invani forest, near Dohne station, MacOwan 2710; Cultivated at Kingwilliamstown from Transkeian seed, 1893, Sim 2164; Shafton, Howick (Natal) 1900, Mrs. Hutton 185.

2. *Gr. Radlkoferi*, Szyz. in Polypetalae Rehmmanianae (1887), p. 49

This species has been somewhat incompletely described. It was considered by some authors (e.g., Gürke l. c., 383) as probably only a variety of *Gr. Sutherlandi* with hairy leaves. This view was all the more excusable as the latter also sometimes produces hairy leaves, while ordinarily (apart from minute glandular hairs) it is practically glabrous, while as we shall see *Gr. Radlkoferi* varies also in this direction. For a long time a plant which had been cultivated at least for the last 20 years at the Grahamstown Botanic Gardens under the name of *Gr. Sutherlandi* greatly puzzled me. The origin of the plant could not be ascertained, and the name was obviously wrong. Mrs. F. Bolus, to whom I submitted it, thought it might be *Gr. Radlkoferi*, but it differed very much from the description. However, some dried specimens from the Transvaal agreed with it in so many respects and approached a little more to the description of *Gr. Radlkoferi* that I did not care

to describe it as a new species, and when submitted to the Director of Kew Gardens, he kindly had it carefully examined by Mr. N. E. Brown, who gave as his final verdict that it is *Gr. Radlkoferi*, Szysz., with somewhat longer petals than in the wild state. It differs chiefly from *Gr. Sutherlandi* by the relative lengths of the petals and stamens, the latter never being more than $\frac{1}{3}$ longer than the former. The peltate glandular portion of the lobes of the disk is narrower, usually ovate-lanceolate subacute. It exhibits a marked peculiarity, which appears to be more or less shared by the other species but which has helped to make its identification difficult. Szyszylowicz describes the branchlets, petioles, and underside of the leafblades as albo-tomentose, and the upper side of the latter as stellate-appressed-pilose. When the first flowers appear (in Grahamstown about the beginning of July) all leaves and young branches are glabrous but for numerous minute glandular, slightly sticky, hairs. Then, for a time, varying in length according to the rigour of the winter, the plant is bare of leaves and only shows a profusion of flowers, but as soon as leaves appear again they agree fairly well with the author's description, but in the course of some months their indument is dropped and moreover leaves appearing subsequently have less and less of it developed, until in November, leaves then formed are *from the first quite glabrous* (not taking the minute glandular hairs into account). The flowering period lasts until the beginning of October and thus flowers may be gathered at different times with two different kinds of leaves and, of course, in between on branches which are bare of leaves. I am in a position to correct and enlarge the author's description in a few other particulars.

In cultivation the plant is a richly branched shrub reaching a height of 2-3 m. ; its leaves have petioles up to 10 cm. in length and blades up to 12 cm. long and 1.4 cm. broad. The flowers are pedicelled; the pedicels are 1-1.5 cm. long. Both peduncles and pedicels are usually pubescent. The racemes are not axillary, but terminal, a leafy shoot just below the apex throwing it on one side. Bracts lanceolate. The sepals are ovate acute. The petals are bright crimson, in cultivated specimens their length exceeds 2 cm. They

are slightly unequal in length in the same flower, obcuneate with the base frequently attenuate; at the apex they are rounded off, subemarginate, undulate or with one or two blunt teeth; the margin is slightly and irregularly reflexed and in its lower portion (as in other species) finely ciliate. The stamens are in two whorls (obdiplostemonous), up to 2.2 cm. long, filaments filiform. The gynaecium does not call for special notice here, but will be referred to again presently as also the disk which bears ten teeth approximated in pairs and bearing peltate ovate subacute glandular appendages which were described as staminodes by the author.

Specimens in the Herbarium of the Albany Museum : Cultivated specimen (native habitat unknown); Waterval onder, Rev. F. A. Rogers, 577 (Oct. 1906, flowers and young tomentose leaves); Tlatilulu, M. M. Stewart, Transvaal Mus. Herb. 8894 (in flower Oct. 6th, no leaves); Barberton, J. Thorncroft, Transv. Mus. Herb. 2968 (Aug. 1906, in flower, no leaves); Barberton, Saddleback Range, E. E. Galpin 404, at 4-5000' (July, Aug. 1889, flowering branch and a leafy branch separate, also fruits). Mr. Galpin notes "Shrubby tree 10-15 feet high. Mountain tops at the head of ravines. Flowers bright crimson, appearing before the leaves."

3. *Gr. Flanaganii*, Bolus in Hook. Ic. Pl. XXIV, t. 2349, Sim, Forest Flora 165, t. 30.

This species is easily recognised by its few-flowered lax racemes, its large flowers from which the stamens protrude considerably, but especially by the structure of the lobes of the disk to which I shall refer again later.

A co-type of the species is in the Herb. of the Albany Museum. It was originally described from the neighbourhood of Komgha, but according to Sim (l.c. 165) is also found on rocky slopes of the Transkei and Pondoland.

Notes on the ANATOMY OF THE STEM and on the LEAF-FALL in
Greyia Radlkoferi.

The base of the leafstalk is broadened and forms a sheath which is decurrent on the stem. The edges of the sheath project on each side very slightly. The sheaths are congenitally united with the stem, the surface of which is not exposed at all. That this interpretation is not merely a playing with words is shown by the structure of the stem when seen in transverse section. If we make such a section, we find that it is surrounded by an epidermis. This is succeeded by a parenchymatous tissue, the outer layers of which have thickened cellulose walls. It is on the whole colourless, only a little chlorophyll being found just underneath the epidermis. Below this tissue there is the real cortex which consists of thinwalled chlorenchyma. The leafsheaths thus form a kind of pseudo-cortex which is plainly differentiated. Between these two tissues there arises sooner or later a cork-cambium. In the pseudo-cortex isolated vascular strands may be seen and if our sections are made successively from the insertion of a leaf downwards we find that these are the leaftrace-bundles. Some of them pass almost at once through the real cortex and join the vascular ring of the stem close to the insertion of the leaf. Others pass inwards lower down, the outermost, however, do not join usually until the level of the next leaf-insertion is reached. The course of these bundles certainly confirms the view that the pseudo-cortex is composed of the leafsheaths which are in congenital union with the stem and this view is further strengthened by the manner in which the leaves fall—sheath, stalk, and lamina being detached together in a similar manner in which e.g. the sheathed leaves of so many *Aloes* become detached (where, however, the sheaths do not become united to the stem). The leaves never last more than one season. Most of them drop off towards the end of summer, and although fresh ones are continually formed even as late as July, they never survive the winter. The fall of the leaves is preceded by a gradual separation of the leafsheaths from one another and from the stem. This proceeds from below upwards.

The separation of the individual leafsheaths is often not complete and there is nothing to indicate why they should separate at all except that one slightly overlaps the other and thus there is a line formed where they can fairly easily tear apart. Sooner or later when the sheath has begun to show signs of drying up, the blade and petiole also dry and eventually the whole comes off together.

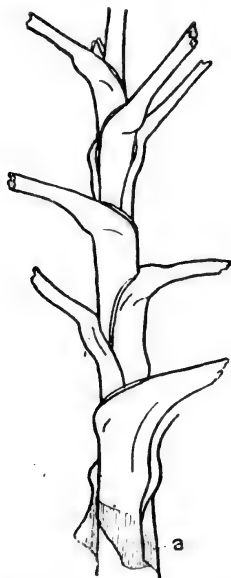


Fig. 1. *Greyia Radlkoferi* Szyszyl. Leafy branch ($\frac{1}{2}$ natural size) with the leaf-blades removed. The shaded portions of the leaf-sheaths, (a), have become detached from the stem and are initiating the fall of the leaves to which they belong.

The loosening of the sheath is preceded by the formation of a cork cambium at the junction of the pseudo cortex and real cortex from the outermost layer of the latter, forming radial rows of cork which are at first interrupted but gradually form a complete ring. The cork cuts off eventually the pseudo cortex from the stem, but the former even then may take a considerable time before it dries up as it remains connected with the leaf. However, the cork gradually extends across the base of the leaf, and this causes

the petiole and lamina to die. An absciss layer such as is usually found at the base of deciduous leaves is not formed. In branches which I examined in December cork-formation started about 4 or 5 inches from the apex while in those examined in May, June and July fully developed cork extended almost right to the apex.

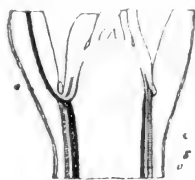


Fig. 2. *Greyia Radlkoferi* Szyszyl. Median longitudinal section of apical bud of a branch which would continue growth (cut in July), showing the extent to which the cork develops towards the apex, *v*=Vascular bundles; *c*=Cork (shaded) (Twice natural size).

Lenticels are not formed until about the time the leafsheaths become detached. Although bulging outwards, they seem to be not primarily responsible for the separation of the leafsheaths, which evidently is only the result of their drying up, and thus the leaf-fall here resembles to a certain extent the leaf-fall in so many herbaceous plants. It is interesting to note that except in the case of one or two of the uppermost leaves of a branch the falling leaf usually carries away its axillary bud.

POLLINATION in *Gr. Radlkoferi*, Szysz.

The flowers are distinctly protandrous. Shortly after the opening of the flowers the episepalous stamens begin to discharge their pollen one after the other. They are then nearly upright, but after the discharge of the pollen they bend outwards between the petals. Now comes the turn of the epipetalous stamens which previously were much shorter but ultimately reach the lengths of the episepalous ones, and go through the same performance. The style remains short during the discharge of the pollen, and its upper end which bears the undeveloped stigma is bent a little to one side or even curved downwards. At last when all pollen is

gone, or at all events when all stamens have bent outwards, the style grows in length until it nearly reaches the length of the stamens, at the same time straightening out, and then the small stigma develops. A rich secretion of nectar aided by the conspicuous colour of the petals attracts numerous bees (and probably other insects) to the flowers and cross-pollination is thus easily effected. Autogamy, even with the aid of insects, is practically impossible.

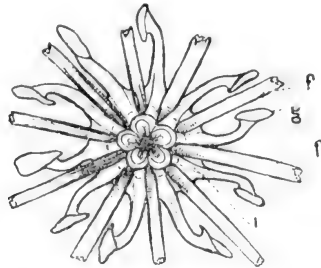


Fig. 3. *Greyia Radlkoferi* Szyszyl. Flower seen from above, with petals and upper portions of stamens and gynaecium removed to show that the disk-lobes have ridges, *i*, which are interstaminal, and to a small extent intra-staminal. *f*, basal portions of filaments, *g*, enlarged glandular portion of disklobes. (Slightly enlarged.)

Remarks on the STRUCTURE OF THE FLOWERS in the genus.

The flowers are so large and their general features are so plain that it seems strange that several of them have been frequently incorrectly described. The structure of the ovary was described by Harvey (Thes. Cap. 1. p. 1 and 2) as "unilocular, formed of 5 carpels whose inflated edges cohere round a very narrow central cavity." He figured this on Plate 1. A similar description is given in the Flora Capensis, II, p. 308 and in Hooker's 2nd edition of Harvey's Genera of South African Plants, p. 61. Eichler in his "Blütendiagramme" II, p. 356, says "Ovary mostly with 5 epipetalous, not quite complete, multi-ovulate chambers, yet not rarely 3, 4, 6 or 7-merous." Guerke in Engler & Prantl's "Natürliche Pflanzenfamilien" III, 5, p. 378 says the "ovules are very numerous; they are seated in two rows on the edges of the

carpels which are turned inwards, but on p. 382 he figures them (fig. 189, F.) on the sides of the carpels in a manner which would make the placentation almost unique. He also shows a hollow in the centre of the ovary which does not exist. As a matter of fact the syncarpous ovary is formed in the usual manner, not only in *Gr. Sutherlandi* (to which the authors mentioned refer), but also in the other two species. The carpels coalesce, though leaving deep grooves, their edges turn inwards, and on each there is a row of ovules, thus forming typical axile placentation with a slightly bifurcated placenta in each of the 5 chambers. This point had already been settled by Sir Joseph Hooker who, in Journ. of Bot., 1873, p. 356, stated that the ovary is "truly 4-5 celled, with the ovules in the inner angle of the cell, as in *Melianthus*" and it has also been fairly correctly figured in Sim., Forest Flora, t. 30*

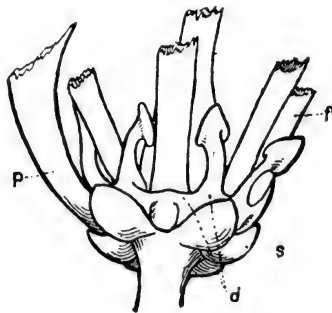


FIG. 4. *Greyia Radlkoferi*, Szyszyl. Sketch to show sepals, *s*, and the disk, *d*, with its lobes which are approximated in pairs but curve towards the nearest epipetalous stamen. The basal portion of some of the filaments, *f*, and of a petal, *p*, are also shown (enlarged).

The stamens are obdiplostemonous in all species (as stated by Eichler, l. c. p. 356, for *Gr. Sutherlandi*). Their arrangement in two rows with the outer one in front of the petals is quite plainly

*But in the key on p. 164 he repeats the old error that it is unilocular. He also refers to the lobes of the disk as staminodes.

seen even in mature flowers though this is denied by Guerke (l. c. p. 377). One has only to cut off the filaments near the base when the position of the stamens reveals itself.

The disk is usually described as an annular extrastaminal structure bearing 10 lobes, but it has been overlooked by most observers that at its base the annular portion is connected by means of 5 ridges with the ovary, completely enclosing the base of the filaments. It thus becomes partly interstaminal and to a small extent even intrastaminal. This point has not altogether escaped Eichler who says that the annular disk pushes inwards ("drängt sich nach innen"). Both in *Gr. Sutherlandi* and in *Gr. Radlkoferi* the disk-lobes are found in pairs, each episepalous stamen standing just between each two forming a pair. They curve, however, towards their nearest epipetalous stamens.

The view (still expressed by Hooker in Journ. of Bot. 1873, p. 357) that the annular disk is crowned by staminodes has been rightly set aside by Eichler (l. c. p. 356, footnote) and has been revived only occasionally by subsequent authors, e.g., Szyszyłowicz, who, in his description of *Gr. Radlkoferi*, speaks of "lobis bidentatis apice staminodiis glanduliferis coronatis." The lobes are simply outgrowths of the disk which in certain portions secrete nectar. In *Gr. Sutherlandi* and *Gr. Radlkoferi*, these are apical subpeltate portions which in the former are suborbicular, whereas in the latter they are more or less narrowly ovate. They secrete nectar on their upper side only. In *Gr. Flanaganii* the lobes are irregularly lacerate-dentate at the apex. Bolus (l. c. Pl. t. 2349) speaks of "lobi eglanduliferi," but this must only be taken to refer to the absence of a distinct glandular portion at the apex. I find in dried specimens that the lobes are "excavate" on the inner side to near the base, and this concave part has all the appearance of a nectar secreting tissue.

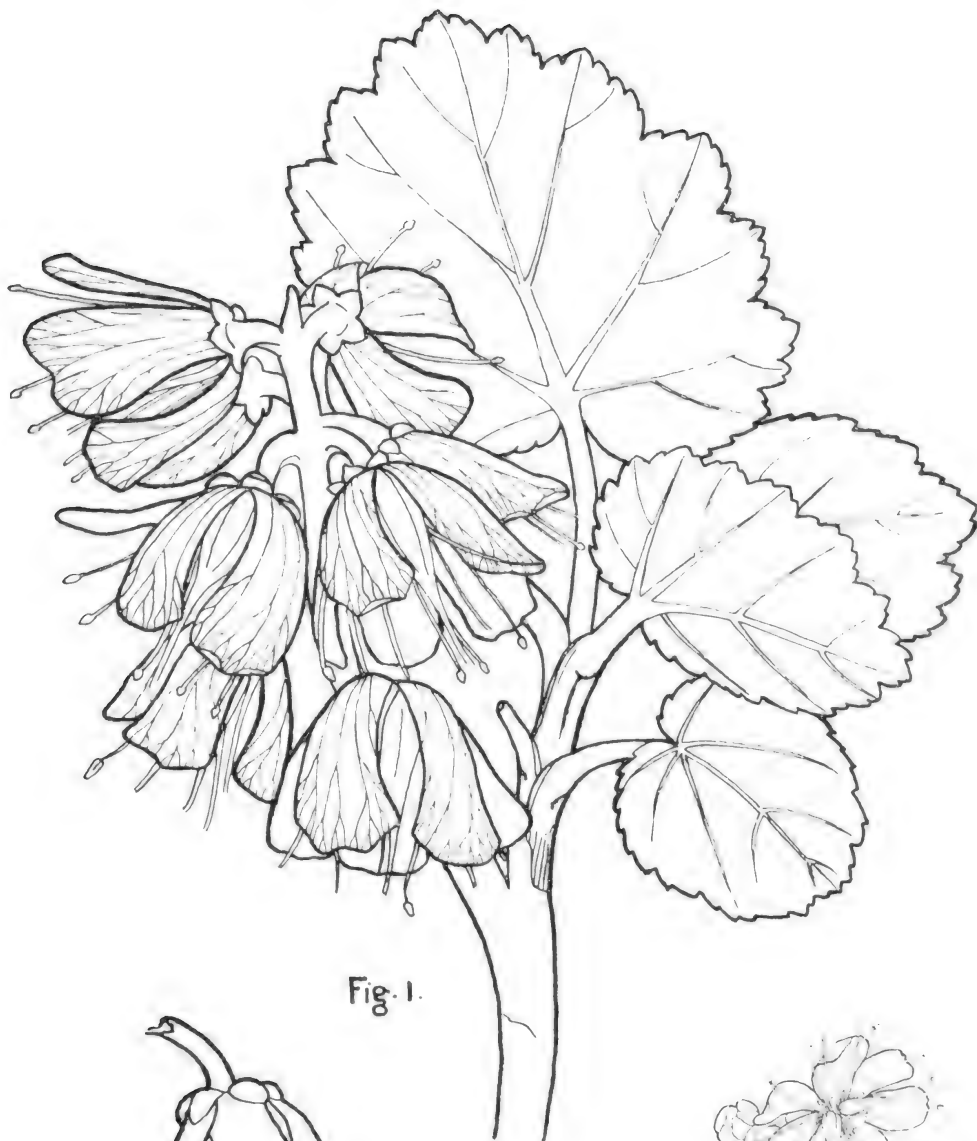


Fig. 1.



Fig. 2

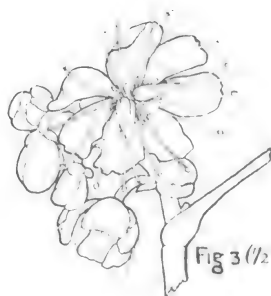


Fig 3 (1/2)



EXPLANATION OF PLATE I.

- Fig. 1. Flowering branch of *Greyia Radlkoferi*, Szyszyl. (natural size), from a cultivated specimen. Grahamstown, July, 1913.
- Fig. 2. Sketch of a flower soon after opening (natural size).
- Fig. 3. A small flowering branch exhibiting a remarkable floral dédoublement ($\frac{1}{2}$ natural size). The "double" flower had 7 sepals, 7 petals, 14 stamens (with corresponding development of the disk) and 2 fully developed gynaecea.

(The drawings on this plate were made from nature by Miss V. Turner of the Grahamstown School of Art, who also supplied the drawings for the figures in the text.)

On some new and some little known South African plants.

By S. SCHÖNLAND.

ERYTHROXYLON ZULUENSE, SchönL. n. sp.

Arbor ramulis tenuibus laxè foliatus. Folia petiolata, petiolis brevibus, laminis oblongis vel ovatis basi cuneatis apicem versus attenuatis apice subacutis vel obtusis, viridibus nitidulis subtus pallidis nervis lateralibus haud prominulis, stipulis deciduis. Cymae pauciflorae axillares floribus pedicellatis. Alabastra ovoidea quam pedicelli 4-6-plo breviora. Sepala ovata acuta basi connata. Petala basi unguiculata quam sepala 4-plo longiora, ungue brevi intus canaliculato marginibus incurvatis incrassatis apice intus appendiculata, appendiculo brevissimo incrassato leviter crenulato, lamina oblonga obtusa. Stamina basi connata filamentis subulatis, antheris leviter curvatis. Ovarium subglobosum trisulcatum stilo cylindrico lobis stigmaticis brevibus ovatis obtusis **dellexis**. **Fructus siccus (?) atro-brunneus 1-spermus oblique ovatus** subrostratus, pericarpio chartaceo; semen endospermicus, testa membranacea; embryo orthotropus cotyledonibus oblongis basi cordatis viridibus.

Internodes about 1.7 cm., petioles 5-7 mm., leaf-blades about 7 cm., sepals about 1.75 mm., claw of petals 2 mm., blade of petals 6 mm., stamens (which ripen successively) about 8 mm., filaments 6 mm., ovary 2 mm., fruit 1 cm. long. Style 3 mm. long and $\frac{1}{2}$ mm. thick.

Ngoya Forest, Zululand, Mr. F. C. Fernando.

This species was sent to me for identification by Mr. C. C. Robertson, District Forest Officer of the Research branch of the Union Forestry Department. As it is undoubtedly new, I drew up

a description, but learned subsequently that Dr. J. M. Wood had also recognised it as new, but had deferred publishing it as he had only insufficient material at his disposal. On communicating with Dr. Wood he very kindly encouraged me to publish my description. In the Flora Capensis three species of *Erythroxylon* are described: namely, *E. caffrum*, Sond., *E. pictum*, E. Mey. and *E. emarginatum* Schum. et Thom. Schinz (in Bull. de l'herb. Boiss. 2me ser. 1, p. 876) placed *E. caffrum* Sond. under *E. emarginatum* Schum. et Thom. as a synonym and Sim ("Forest Flora" p. 150) united them all under *E. monogynum* Roxb., "the three species described in the Flora Capensis appearing to him so far as represented by specimens examined to have no further distinctions than occur in individual trees through variation in exposure or luxuriance or in the stage of advancement of flowers." As I have no types of the species mentioned I do not venture to express a definite opinion on this point, but the specimens under the above names in the Herb. of the Albany Museum seem to me to represent two distinct species. As regards the new species it shows various characters such as an inconspicuous petal-crest, a very short staminal tube and a practically undivided style, which distinguish it plainly from all the above and also from *E. Mannii* Oliv. (Flora of Tropical Africa 1, p. 274). Moreover, Mr. Fernando, Head Forester of Ngoya, writes: "This species differs so considerably in habit and in the morphology of its wood, bark and leaves from *E. monogynum* that it would be readily recognised as a distinct species in the field. Both species occur in the same forest, under nearly or quite similar edaphic conditions, each showing no tendency to variation." There remain to be compared two species described from the continent of Africa, namely *E. delagoense* Schinz (Bull. de l'herb. Boiss. 2me ser. 1, p. 876) collected near Delagoa Bay by Rev. Junod (no. 207) and *E. pulchellum* Engl. (in Bot. Jahrb. XXXIV, p. 149) collected by Dr. R. Schlechter near Delagoa Bay (no. 11600). I have only seen one of Schlechter's specimens, but judging from the descriptions I incline to the opinion that *E. delagoense* Schinz and *E. pulchellum* Engl. only represent one species. However that may be there

cannot be the slightest doubt that our species is quite distinct, as both these species have much smaller flowers and show other differences in detail (different shape of leaves &c).

The following notes on *E. zuluense* were supplied by Mr. Fernando :

HABIT : Small trees, with well defined boles ; from 20 to 40 feet high and from 5 to 8 inches stem diam. breast high, clear boles from 10 to 20 feet. Gregarious or more rarely sporadic.

BARK : Outer bark smooth, thin, inner bark red.

WOOD : Red. Twigs and shoots quite glabrous. Young foliage light russet brown, mature leaves of a papery texture, quite glabrous dark green and shining (lucid). Petals white.

HABITAT AND RANGE : Ngoya Forest, Zululand, from 900 to 1,500 feet above sea level, very common. I have not observed it in other Zululand Forests visited by me.

SYLVICULTURAL PECULIARITIES : It is commonly met with in a gregarious form in rocky localities, and a granitic dry soil, where it forms the bulk of the stand and was referred to as being the index species to a soil quality type in my report on the Ngoya Forest. It also spreads into adjoining localities with deeper soil, but in a sporadic form, where probably better soil conditions enable other species, equally shade-bearing, to overcome it in the struggle for existence. The species is a heavy shade bearer, at least when young, and reproduces itself freely in the forest.

UTILIZABLE PROPERTIES ; The wood is tough and elastic. It is much prized by natives for sticks. It makes good yoke skeys, and when obtainable in suitable sizes, excellent disselbooms.

The vernacular name of the tree is *iQweleba*.

PSORALEA PATERSONIAE Schönl. n. sp.

Fruticulosa ramosissima ramis striatis leviter curvatis ; rami novelli, petioli, pedunculique primum tomentosi demum glabrescentes atro-brunneo-punctati ; internodia quam folia breviora.

Folia stipulata longe petiolata trifoliata, stipulis ovato-lanceolatis acutis persistentibus, petiolis striatis gracilibus; foliola subovata basin versus cuneata apice subacuta, margine medio et superiori irregulariter dentato-crenulato vel erosulo, utrinque puberula subtus ad venos hispida demum utrinque glabrescentia atro-brunneo-punctata, lateralibus breviter petiolulata inaequalia, intermedium longe petiolulatum. Inflorescentiae ex axillis foliorum superiorum laterales elongatae dense subspicatae pedunculatae; pedunculi petiolis similes. Bractae quam flores paulum minores tomentosae et atro-brunneo-punctatae ovato-lanceolatae acutae. Flores gemini brevissime pedicellati, pedicellis tomentosis. Sepala connata, tubo quam lobi posteriores paulum breviori, tomentosa et atro-brunneo-punctata; lobi lanceolati, lobo anteriori quam caeteri longiori et latiori. Vexillum sepalis subaequilongum late obovatum basi breviter unguiculatum, apice obtusum irregulariter crenulatum. Alae carinam fere usque ad medium adnatae linguatae obtusae quam vexillum breviores. Petala carinalia apice connata. Stamen vexillare liberum; tubus staminalis leviter curvatus. Ovarium parvum glabrum elongatum breviter stipitatum 1-ovulatum; stylus gracilis; stigma crassum capitatum. Legumen atro-brunneum ovale compressum verrucosum.

Internodes 3-6 cm., stipules about 1.5 cm., petioles 3-5 cm., stalk of lateral leaflets about 5 mm., of the middle leaflet nearly 2 cm., blade about 5 cm., bracts 5.5 mm., pedicels 1 mm., calyx-tube about 2 mm., lateral and posterior calyx-lobes about 3 mm., anterior calyx-lobe 4.5 mm., vexillum 6.5 mm., alae 5 mm., carina 5 mm., fruit 4.5 mm. long.

Redhouse, December, 1908, Mrs. T. V. Paterson 393.

This species is allied to *Psoralea caffra* E. & Z. It can at once be distinguished by the shape of the leaves and by the fruits which in *P. Patersoniae* are glabrous but decidedly verrucose, whereas in *P. caffra* they are pubescent.

SOME CRASSULAE COLLECTED BY MR. T. R. SIM AT DIDCOT, MOOI RIVER, NATAL, MARCH, 1914.

Mr. Sim recently sent me live specimens of *Crassula vaginata*, E. & Z., *Cr. curta*, N. E. Br. (in Kew Bulletin, 1895, 144=*Cr. Schlechteri*, Schönl., in Journ. Linn. Soc. (Bot.) XXI (1897), 551), *Cr. drakensbergensis*, Schönl., and *Cr. rubicunda*, E. Mey. The two former have been minutely described, but I may point out that it seems to me doubtful whether *Cr. curta*, N. E. Br., is distinct from *Cr. Cooperi*, Reg. (in *Gartenflora* (1874) XXXVI t. 786). *Cr. drakensbergensis* was described by me from dried, rather poor specimens and I did not then notice a marked peculiarity of this species, namely its spreading petaloid sepals, which are unique in the genus, and as I can supplement now the description in several other particulars I thought it best to give a full description of it. *Cr. rubicunda* has not been very minutely described and certainly never from living wild specimens. I, therefore, append also a description of this species.

CRASSULA DRAKENSBERGENSIS, Schönl., in Bull. de l'herb. Boissier V (1897), 861. There were two simple branches available, the longest (with inflorescence) 20 cm. long.

Stem reddish, terete, rather woody, swollen at the nodes, internodes less than half the length of the leaves, subglabrous. Leaves connate, narrowly lanceolate, acute, attenuate at the base, slightly fleshy, soft, on both surfaces with scattered hairs, on the margin densely retrorsely papillose-ciliate, the longest seen 5.5 cm. long, upper gradually smaller.

Inflorescence terminal, richly branched, cymose-corymbose, 5-6 cm. broad, ultimate branches almost white; floral bracts very small, lanceolate, ciliate on the margin, pedicels 2-4 mm. long.

Sepals glabrous, spreading, petaloid, pale yellowish white, thin, narrow oblong, united at the base, mucronulate, tube 1 mm. long, lobes about 2.25 mm. long.

Petals resembling the sepals, broadly oblong with a tiny mucro behind the apex, suberect but spreading in the upper

portion, about 4 mm. long. Stamens about 3 mm. long, filaments subulate, anthers oblong, pale yellow. Carpels about 2·5 mm. long, yellowish; ovaries elongate, minutely ciliate on the inner margin, passing gradually into the short cylindrical styles.

Squamae pale yellow, fleshy, broadly subrectangular.

CRASSULA RUBICUNDA, E. Mey. Harvey in Harvey and Sonder, Flora Cap. II, 341; Baker in Saunders, Refugium Botanicum V, t. 339. One branch available, which, with the inflorescence, was 20 cm. long.

Stem simple, fleshy, terete, retrorsely pilose, internodes much shorter than the leaves.

Leaves connate, lanceolate, acute, fleshy but nearly flat, margin ciliate, lowest (in the specimen seen) 12 cm. long and about 2 cm. broad, upper gradually smaller.

Inflorescence terminal, richly branched, cymose-corymbose, about 11 cm. long and broad, ultimate branches deep red; floral bracts 3-5 mm. long, otherwise similar to the foliage leaves, pedicels about 4 mm. long. Sepals erect, united at the base, lanceolate acute, ciliate on the margin, 2-3 mm. long.

Petals strap-shaped, nearly free, erect to nearly $\frac{3}{4}$ of their lengths, upper part recurved, with a longitudinal red stripe (narrowing above) and white margin or quite red, but in any case always getting dark red when withering, with an acute mucro behind the apex, about 4 mm. long.

Stamens a little shorter than the petals; filaments subulate, almost white; anthers ovate, reddish outside, yellowish inside. Carpels smaller than stamens about 2·25 mm. long; ovaries elongate, inner margin ciliate; styles short, cylindrical; stigmata small, capitate.

Squamae orange, fleshy, broadly subrectangular, slightly emarginate.

The flowers have a foetid smell which, however, is not very pronounced.

CARALLUMA PILLANSII, N. E. Br. in Fl. Cap. IV, 1, 876.

The masterly descriptions by Mr. N. E. Brown of the Asclepiadaceae in the Flora Capensis are generally fully sufficient to enable one to determine described South African species of this difficult order. A plant collected by Dr. H. Brauns between Beaufort West and Willowmore, which I have grown for several years, could not be determined by me until I came to the conclusion that it must be *C. Pillansii*. It differs from the description chiefly by having incumbent inner corona lobes, whereas they were in the original specimens "erect, not inflexed over the anthers." Other differences are too slight to justify a specific distinction, but I give a full description of my plant so that these can be clearly judged. Some of them are no doubt to be accounted for by the fact that Mr. Brown described flowers which were preserved in fluid, whereas I had fresh ones before me. The species was originally described from specimens found near Montagu.

Plant about 38 cm. high, robust, with only one rooted stem, bushily branched; main stem thick, 4 angled with a shallow groove between the angles, greyish; branches about 2 cm. thick, exclusive of the teeth, 4 angled, angles acute and stem deeply grooved between them, with numerous irregular dark brown blotches on a glaucous background; angles with stout much compressed deltoid-conical, slightly downwardly curved teeth about 1 cm. long and (lengthwise of the stem) as much in breadth at the base, with short pale spine-like tips; flowers few or numerous together in dense fascicles along the grooves of the youngest branches, rarely on the older ones, a few of each fascicle opening together; pedicels 3-5 mm. long whitish with elongated purplish spots; sepals ovate-lanceolate acute, 2-2.75 mm. long, whitish with small dark purple spots; corolla fleshy, foetid, tube campanulate, slightly swollen, 5 mm. long, with large irregular purplish spots on the outside and large dark purple spots and soft hairs on the inside; lobes erecto-patent, 11 mm. long, oblong-ovate attenuated at the base, acute or abruptly acuminate, the sides folded back, uniformly

purple on the outside, the inside on a light red (almost white) pubescent background with slightly raised dark red, irregular blotches covered with dark purple short hairs, with a fine dark red line along the margin; outer corona-scales 5, about 1 mm. long and nearly as broad, about equalling the staminal column, dark brown, almost rectangular, with rounded upper corners, slightly emarginate at the top and on the sides; inner corona-scales connected at the base with outer, lingulate and obtuse, varying in size, usually about 1 mm. long, dark brown and thickened at the base, thinner and pale brown with a dark marginal line in the larger upper portion, closely incumbent on the staminal column. Follicles unknown.

ALBUCA ROGERSII, Schönl. n. sp.

Bulbus subglobosus, membranaceo-tunicatus, haud fibrosus. Folia plura suberecta sublinearia longissima tenuia extus convexa intus concava viridia, marginibus pallidis, utrinque venis conspicuis costa laterali prominula. Scapus teres longissimus, racemo laxo pedicellis longis erecto-patentibus apice cernuis. Bractee membranaceae albae rubro-lineatae lanceolatae acutae quam pedicelli breviores. Flores suberecti petalis exterioribus albis medio viridistriatis, interioribus quam exteriora paulo brevioribus; staminibus omnibus fertilibus perianthio paulo brevioribus, stilo prismatico obverse pyramidato apice cuspidato quam ovarium subduplo longioro.

Bulb about 7.5 cm. long; leaves up to 1.1 m. long, about 3.7 cm. broad; peduncle circ. 90 cm. long; lower pedicels after flowering 6.25 cm. long, upper gradually smaller; bracts about 2.5 cm. long; flowers about 2.1 cm. long, sometimes shorter; anthers of outer stamens about 4.5 mm. long, those of inner about half that length.

Stutterheim, Rev. F. A. Rogers 12781, Dec. 1913.

The structure of the flowers, as regards details in the petals, stamens and ovary is very similar to that of *A. fastigiata*, Dryand.

and allied species, and has therefore not been minutely described. It is most closely allied to *A. Nelsoni*, N.E. Br., the type of which, however, is described as having lanceolate leaves, 4.5 cm. broad at the base, and has much longer flowers; in fact they are nearly twice the length as compared with *A. Rogersii*. Perhaps when the genus is better known than at present *A. Rogersii* will have to be placed as a variety under *A. Nelsoni*.

ALBUCA GLANDULOSA, Bak.

This species is only known from the description (Gard. Chron. 1875, 111, 814, and Flora Capensis VI, 453) which was based on a specimen raised from a bulb sent by the late Dr. MacOwan. Specimens agreeing well with the description were found by the Rev. F. A. Rogers at Alicedale (in flower Oct., 1913). The original probably came from Somerset East.

SCILLA MOSCHATA, Schönl., n. sp.

Bulbus subglobosus membranaceo-tunicatus brunneus. Folia synanthia ovato-lanceolata plicata ensiformia basi vaginantia glaucoviridia, marginibus angustis pallide rubris, maculis numerosis oblongis vel suborbicularibus brunneis, basin versus extus striis irregularibus transversalibus rubro-brunneis ornata. Scapus arcuatus subteres quam folia brevior. Racemus subdensus arcuatus multiflorus. Bracteae breves deltoideae cuspidatae. Pedicelli patentes filiformes. Alabastra primum lutea, postea viridia. Petala supra basin patentia, segmentis linearibus viridibus marginibus pallidis, vel interdum extus basin versus rubriusculis, exteriora apice cucullata. Stamina erecta petalis subaequilonga, filamentis parte infimo albis, supra medium coerulesco-viridibus apice brunneis, antheris apertis luteis. Ovarium stipitatum 6-sulcatum basi discoideo ampliatum. Stilus brunneus staminibus subaequans.

Bulbs 3.5-5 cm. long and broad; leaves 15-30 cm. long, about 3.5 cm. broad in the middle; scape about 17 cm. long; bracts about 3 mm. long; pedicels about 9 mm. long; petals 5.5 mm. long.

Stutterheim, Rev. F. A. Rogers, 12786, Dec., 1913.

This species may be placed near *Scilla zebrina*, Bak.

The yellow buds of *Sc. moschata* seem to be unique in the genus.

The flowers emit a very strong musky smell.

SCILLA GRANDIFOLIA, Schönl. n. sp.

Bulbus globosus. Folia 3 synanthia breviter vaginantia oblongo-lanceolata vel ovalia acuta magna crassa firma, venis supra prominulis, prasina subtus pallida margine angusta tenui albida cincta. Scapus gracilis arcuatus foliis subaequilongus vel longior. Racemus oblongus subdensus. Bracteae ex basi brevi deltoideo cuspidatae. Pedicelli patentes graciles cernui quam flores circ. $2\frac{1}{2}$ -plo longiores. Perianthium campanulatum, segmentis supra basin patentibus oblongo-lanceolatis obtusis albidis medio viridistriatis. Stamina quam petala breviora filamentis antherisque albidis vel pallide violaceis. Ovarium breve depressum 3-sulcatum, stilus filiformis gracilis quam stamina longior.

Bulb about 6.75 cm. in diameter. Leaves about 30 cm. long, 5-10.5 cm. broad. Scape 28-50 cm. long, about 3 mm. in diameter. Bracts about 2 mm. long. Pedicels 12-14 mm. long. Perianth about 5 mm. long.

In wet places Devil's Kloof, 15 miles north of Tzaneen (Lat. $23\frac{1}{2}^{\circ}$ S., Long. 134° East), Northern Transvaal; Rev. F. A. Rogers, 1913.

CYTANTHUS STAADENSIS, Schönl. n. sp.

Bulbus subglobosus vel oblongus tunicis tenuibus viridi-brunneis vel griseis. Folia synanthia, 2-3, erecto-patentia basi vaginantia, vagina longa alba membranacea, lamina saturate viridi angusta longissima subsetacea acuta intus canaliculata. Scapus teres parte inferiori alba, superne viridis quam folia longior. Flores 2-3 (rare 4-6) umbellati bracteis 2 lanceolatis quam pedicelli longioribus. Pedicelli suberecti leviter arcuati. Perianthium coccineum, tubo infime anguste cylindrico arcuato, superne recto ampliato subventri-

coso, lobis patentibus ovato-lanceolatis. Stamina leviter exserta subbiseriata, filamentis brevibus incurvis antheris oblongis luteis. Ovarium oblongum, stilus quam stamina multo longior lobis stigmaticis brevibus obtusis.

Bulb 2-3 cm. in diameter; leafsheath 4-5 cm. long; blade slightly broader in upper part than in lower, 25-28 cm. long, 2 mm. wide in the broadest part; scape about 40 cm. long; spathe-valves 2-5 cm. long; pedicels 12-17 mm. long; lower curved portion of corolla-tube 6 mm. long and 1.5 mm. broad, upper straight portion 3 cm. long and 1 cm. broad in the broadest portion, lobes 1 cm. long; filaments about 3 mm. long; style exceeding the anthers by 7 mm.; stigmatic lobes circ. 1 mm. long.

Vanstaadens, Mrs. Smart, March 1910. I have also seen a specimen which is said to have been collected in Ferns Kloof near Grahamstown in March 1911.

Allied to *C. MacOwani* Bak. but whereas in this species the lower part of the perianth-tube passes gradually into the upper, enlarged portion, in *C. Staadensis* the two parts are very distinct and the upper portion is moreover decidedly swollen.

CYRTANTHUS SUAVEOLENS, Schönl. n. sp.¹

Folia 2-3 linearia obtusa dorso carinata subglauca basin versus rubescentia. Scapus gracilis glaucus basin versus rubescens. Flores 3 umbellati cernui suaveolentes, bracteis 2 lanceolatis quam pedicelli longioribus, pedicelli graciles suberecti. Perianthium coccineum suberectum vel curvatum tubo subcylindrico quam pedicelli 2-3 plo longiori sursum gradatim et leviter dilatato, lobis brevibus latiovatis, obtusis, deflexis. Stamina haud exserta distincte biseriata antheris subsessilibus oblongis luteis. Ovarium oblongum. Stilus gracilis demum exsertus apice tricuspidatus.

Leaves and scape 15-20 cm. long.; spathe-valves 2-5 cm. long; pedicels 1.2-2 cm. long; perianth about 3.7 cm. long, tube at the top

¹ The description is based to a certain extent on notes supplied by Dr. J. Brownlee of Kingwilliamstown.

about 3 mm. wide, segments about 3 mm. long; filaments 1.5-2 mm. long.

Pirie Mountain, Oct. 1913 (communicated by Dr. J. Brownlee).

This species is allied to *C. odoratus*, Gawl (in Bot. Reg. t. 503), but in *C. suaveolens* the leaves are broader, the flowers are dark red, the perianth segments are much broader and shorter and markedly turned downwards, the filaments are shorter.

The flowers emit a very strong odour of cloves.

CYRTANTHUS JUNODII, Beauv. in Bull. de l'herb. Boiss., 2me. ser., tome VII (1907) 438.

This species is according to the author allied to *C. Huttoni*, Bak. and this is borne out by the description and especially by the illustration accompanying it. A plant represented by a flowering scape and one leaf was sent to me in Nov., 1913, by Dr. John Brownlee which comes close to this species. It was found by Mr. Hugh Brownlee on the Amatolas. *C. Huttoni* was probably found by Mr. H. Hutton on the Katberg. No locality is mentioned with the original description and in the Flora Capensis (VI, 220). We have a specimen collected by Galpin on the Katberg (no. 1745) which according to the late Mr. Andrew Smith is *C. Huttoni*. It differs, however, from the description in the Flora Capensis and from the figure in Bot. Mag. t. 7488 by somewhat longer flowers and narrower lower portion of the perianth-tube. Neither in our specimen nor in the figure cited is the throat of the perianth $\frac{1}{8}$ - $\frac{1}{6}$ " in diam. as stated by Baker. In both it is about $\frac{1}{3}$ " wide. The specimen from the Amatolas bears only 2 flowers, the limb of the corolla is green (yellow in *C. Junodii*), the flowers are somewhat smaller than in *C. Junodii*. The outer petals are crested on the inside near the apex as in *C. Junodii* and *C. Huttoni*. Another specimen collected by Mrs. H. Hutton at Ripplemead, Kaboosie (April 1904) also represented by one flowering scape and one leaf comes even closer to *C. Junodii*, except that while two of the flowers are curved as in this species, 4 are almost straight. A

decision whether we are dealing here with several closely allied species or one variable species must be left over for the present. The object of this note is simply to draw attention to the fact that there is a great deal of taxonomic work yet to be done with this group of *Cyrtanthus* as with all other species of this genus before we have a competent knowledge of them.

Archaster Patersoni, n.sp. A new South African fossil Starfish.

By W. K. SPENCER, M.A., F.G.S.

[PLATE II.]

PLACE OF ORIGIN. The block of limestone in which the specimens of this new fossil Starfish are embedded was collected by Mrs. T. V. Paterson in a wash-out on the side of a hill near Redhouse (Port Elizabeth). I am greatly indebted to the discoverer and to Mr. Hewitt of the Albany Museum, for the privilege of describing the form.

GEOLOGICAL AGE. Dr. A. W. Rogers has kindly examined the matrix in which the fossils are embedded, and he tells me that the block almost certainly belongs to the beds lying unconformably upon the Uitenhage beds (Neocomian). The exact age of these upper beds has not been settled. They may include Upper Cretaceous and Tertiary beds.* For my part I believe that this new Starfish is of Tertiary age. As will be seen from the following description the form undoubtedly belongs to the recent genus *Archaster*, and is little different from recent forms of that genus. Work on the Cretaceous Starfish of North-West Europe† has shown us that these forms differ considerably from those found in recent times, and by analogy we should expect that if the new forms were Cretaceous they would at any rate show some points of structure markedly divergent from those observed in the living forms.

AFFINITIES. This new species is in fact very closely similar to the recent species *Archaster tenuis* Bell, which has only been

*The Tertiary beds of Redhouse belong to the Alexandria formation of Prof. Schwarz. In an important paper on some shells found in those beds (Vol. II p. 315—352 of this publication), Mr. R. Bullen Newton refers them to Mio-Pliocene Age.—[Ed.]

†Spencer, W. K. "The Evolution of the Cretaceous Asteroidea." Phil. Trans. B, 1913.

found on the Macclesfield Bank off the coast of Australia. There are two other species of *Archaster*: *A. typicus* Müll. and Trosch. and *A. angulatus* Müll. and Trosch., both widely distributed in the warmer waters of the Indian and Pacific Oceans, and both quite distinct from the new fossil form.

MANNER OF LIFE. It is also interesting to note that the five individuals of the Starfish are closely packed together on one small block. This crowding of the individuals suggests that at the time of their entombment they were living in the midst of an abundant food supply. The matrix contains a fair number of fragments of mollusc shells, and we may surmise that we have here evidence of an ancient bed of molluscs upon which the Starfish fed.

GENUS ARCHASTER Müller & Troschel, 1840.

***Archaster Patersoni*, n.sp.**

SPECIFIC CHARACTERS. Arms moderately extended, the major radius being approximately four times the minor radius. Mouth-Angle Plates small. Ventrolateralia small.

If my reconstruction be correct the form differs from *A. lennis* in the shorter length of the arm and the smaller number of Infero-marginalia. The five individuals are taken as co-types of the species. The specimen is preserved in the Albany Museum, Grahamstown, S. Africa.

DESCRIPTION. Figure 1 is a sketch of the block of limestone in which the starfish are embedded. The outlines of the individuals are shown, and lettered for convenient reference. Individuals A, B, C, and D are all exposed with their oral (ventral) surfaces uppermost. They are much weathered, and since an accurate drawing of any of them would convey little in itself, I decided to ask Mr. Browning to reconstruct, under my directions, a representation of the whole of the ventral surface as it must have appeared in the living animal. This is Figure 2 of the Plate. References are given in the description of the figures to the portions of the fossils from which the reconstruction has been made,

Figure 2 shows clearly that the fossils belong to a species of *Archaster*. The arms are long and pointed, the angles between the arms are pointed, and there are very few Ventro-lateralialia. The Infero-marginalia are oblong, possess an even surface, and have a spinal armature similar to that on recent species of *Archaster*.

The reconstruction of the region of the mouth (Fig. 5) is based upon Specimen C, which shows three mouth-angles and the corresponding interradiial portions of the disc. The mouth-angle plates are very thin and are only a trifle larger than the adambulacralia which succeed them. They contrast quite sharply with the stout mouth-angle plates of *Archaster typicus*, but are very similar to those of *A. tenuis*. The oral spines cannot be distinguished. The proximal adambulacralia are also thin and closely crowded. The first five occupy a space equal in length to the first Infero-marginal.

Specimen C has the ambulacral groove filled with hard calcite, which I have not been able to clean away. Specimen A, however, shows the ambulacral groove open throughout the entire length of the arm preserved. The exposed mouth region shows that the ossicles there have exactly the same arrangement as in recent species of *Archaster*. Immediately exterior to the mouth-angle plates and proximal adambulacralia there is a small space between those elements and the Infero-marginalia. This was obviously at one time filled with a row of Ventrolateralialia. Post-mortem changes have made the exact number and shape of these Ventrolateralialia difficult to determine. The figures given show the ossicles as I believe them to have existed, but complete reliance must not be placed upon my interpretation.

The Infero-marginalia usually weather in rather a curious way. The interior is dissolved before the exterior, which remains as a box-like shell. The lid (exposed surface) of the box is usually destroyed, but fortunately a sufficient number remain to render possible a fairly complete account of their ornament.

The typical ornament of a recent species of *Archaster*, *A. tenuis*, is shown in Figure 4. It is seen that there are flattened scale-like spines, arranged in rows somewhat slantwise across the ossicle.

The outer row has at least one conspicuous large spine, and occasionally two or more. This fringe of large spines is an important character of *Archaster*. The Infero-marginalia on two of the specimens under description also show these large flat spines. One or two rows of smaller spines, similar to those found in *A. tenuis*, may also be observed. The spines have disappeared from the more exposed portions of the ossicles and are only represented by spine-pits; but the spines on the margins of the ossicles are preserved, because they are kept in place by the matrix in which the fossils are embedded.

No single specimen shows an arm in entire length. The more distal portions of the arm have been fitted on from Specimen D. I am not sure now whether the entire length of the arm as reconstructed is quite as much as it was in the living animal. The measurements of the specimen as figured give R : r :: 46 mm. : 11 mm. The measurements closely approximate to those of *A. typicus*. Both *A. angulatus* and *A. tenuis* usually have arms somewhat longer proportionately.

There were about 28 Infero-marginalia in the adult form, if the reconstruction be correct.

The adambulacralia are usually much weathered and never show the original armature. They are frequently dissolved away so as to expose the base of the ambulacralia. The drawing (figure 7) gives a view of the ambulacralia exposed in this manner, and incidentally shows the near approximation in character to those of the recent *Archaster*. Specimen E shows the ambulacralia in apical (dorsal) view. This is the only specimen which is exposed from this side, and it is unfortunate that it is so far weathered that even the Supero-marginalia have disappeared.

Here and there, excavations with a needle have enabled me to expose the arm in lateral view. All that one can say is that the Supero- and Infero-marginalia are opposite, and that the arm is flat in cross section. Both points are important, however, as confirming the opinion that the form belongs to the genus *Archaster*.

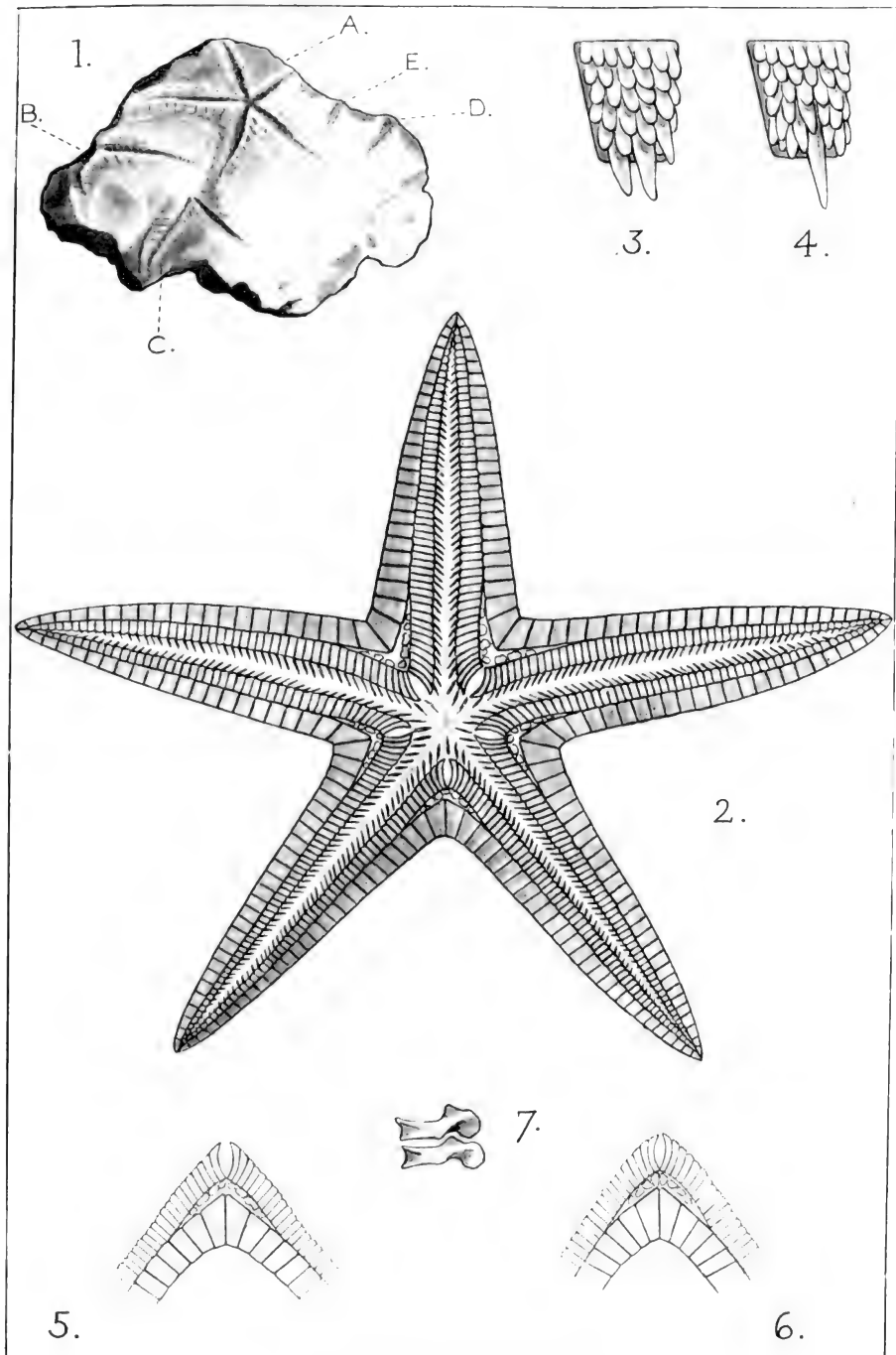


PLATE II.

- Fig. 1. A small sketch of the block indicating the position of the individuals of *Archaster Patersoni*, n. sp.; $\times \frac{1}{2}$.
- Fig. 2. A reconstructed view of the oral (actinal) surface of *Archaster Patersoni*; $\times \frac{1}{3}$.
- Fig. 3. A reconstructed view of the ornament of an Infero-marginal of *Archaster Patersoni*; $\times 7$.
- Fig. 4. The ornament on an Infero-marginal of *Archaster tenuis*, Bell; $\times 6$.
- Fig. 5. The Plates in the Mouth-Angle of *Archaster Patersoni* (oral view); $\times 2$.
- Fig. 6. The Plates in the Mouth-Angle of *Archaster tenuis*; $\times 3$.
- Fig. 7. Two ambulacralia of *Archaster Patersoni* (oral view) magnified.

Descriptions of New South African Arachnida.

By JOHN HEWITT.

ORDER SOLIFUGAE.

Blossia maraisi, sp. nov. (Text fig. 1.)

TYPE : A single adult male specimen taken at Peddie by Mr. B. Marais. This species is closely related to *B. karrooica*, Purc. (Ann. S. Af. Mus. II p. 217), agreeing therewith very closely in the dentition but differing therefrom in the following characters : the distal dorsal bristle of the chelicera is not different in any way from the other bristles of the neighbourhood, being slender and quite devoid of granulation in any portion of its length and not reaching to the tip of the fang ; the flagellum is somewhat different in shape, its distal portion being more slender than that of *karrooica* and not so suddenly acuminate at the apex. It also resembles *B. echinata*, Purc. from Hanover (Ann. S. Af. Mus. III p. 16, pl. 1, fig. 10), but differs therefrom in the dentition of the upper jaw, in the absence of a dorsal tooth and in the form of the flagellum.

FLAGELLUM seen from the side is slightly sigmoidly curved ; it is broad at the base and slender in its apical half, eventually tapering to a point. The basal portion is a hollow capsule considerably compressed laterally, but with a convex surface on the mesial side and a more flattened surface on the side adjacent to the jaw ; on this flattened surface there is an elongated slit-like opening. The slender distal portion of the flagellum has no lumen, being a slightly curved flattened rod, and is strongly twisted at its base so that the apex is directed upwards and towards the midline of the animal : it is not so long as the swollen basal portion. The greater portion of the flagellum in its natural position lies not lateral to the jaw but immediately above it.

CHELICERAE : The first tooth is a thin lamina without chitinous thickening. The fourth tooth of the upper jaw is smallest, the sixth also small ; the inner row of the double series is composed

of 2 very large teeth. There is a strong projecting tooth on the outer side of the jaw adjacent to the second tooth of the main row. In the lower jaw the strong projecting lamella on the inner surface is opposite to the distal tooth which is much nearer to the second tooth than to the tip of the jaw, which is apparently not the case in *karrooica*.



FIG. 1.

Blossia maraisi, sp. nov. Right chelicera of male viewed from inner side (the isolated tooth shown on the upper jaw occurs on the outer side of the jaw).

The fleshy hairs on the second abdominal segment inferiorly are in two clusters, one containing 3 hairs, the other only 2 hairs.

The spines and setae on the tergites are all notched at the tip, the spines of the anterior tergites more distinctly so.

COLOUR: Pale yellowish brown throughout without pronounced infuscation.

TOTAL LENGTH: 7.5 mm.

ORDER ARANEAE.

Family CTENIZIDAE.

Idiops parvus, sp. nov.

TYPE: A single female example, apparently quite adult, from Zonderhout, Holfontein, O.F.S. (Mr. T. F. Austin). This species is probably closely related to *I. fryi* (Purcell) [Ann. S. Af. Mus. III p. 91] from which I distinguish it by the following characters: The common tubercle carrying the frontal eyes is so low and the

median groove so deep that those eyes are practically situated on two separate tubercles : anteromedian eyes of moderate size, considerably larger than the posteromedians and scarcely more than a diameter apart : distance between posteromedians subequal to or only a little less than the distance between a posteromedian and posterolateral.

Other characters are : frontal eyes scarcely two-fifths of a diameter apart, their visual axes only slightly inclined to each other : area formed by frontal and anteromedian eyes sub-parallel sided, about twice as wide as long : posterolaterals long and reniform, the posterior margins of the posterior row about in the same transverse line : tibia II with 5 or 6 spines on its anterior side : patella IV with the band of spines on its anterior side only stretching three-fifths or two-thirds of the length of the segment : tibia IV without spines on its anterior surface or with only a single one on the lower half of that surface : chelicerae with 5 larger teeth and 4 smaller ones in the inner row of the fang groove and with 6 larger teeth and 1 or several smaller ones in the outer row : carapace only very slightly shorter than the tibia and metatarsus of the fourth leg.

MEASUREMENTS : Total length 29 m.m., length of carapace 10.25 m.m., breadth of carapace 8.8 m.m.

COLOUR : Pale brown almost throughout, the chelicerae reddish, the abdomen only slightly infuscated anteriorly above.

This is the smallest species of *Idiops* known to me. Various South African species have been founded on much smaller specimens but I think such specimens must have been immature. It is, however, hardly possible in many cases to judge with certainty on the degree of maturity of single specimens casually collected : a dark colouration of the glabrous portion of the genital plate is probably a sign of sexual maturity.

***Pelmatorycter crudeni*, sp. nov.**

TYPES : A series of 15 female examples, including several adults, from Alicedale, C.P., presented to the Albany Museum by Mr. F. Cruden.

COLOUR : Carapace castaneous, most deeply so just in front of the fovea: a paler area just behind and lateral to the eyes on each side and a still paler patch near the margin opposite the coxae of the third pair of legs. Chelicerae blackish brown. The patella and more distal segments, except the tarsi, of the palps and legs are pale, whilst the more basal segments of those appendages are castaneous: this is not so pronounced on the two posterior pairs of legs. Abdomen purplish above, paler below.

OCULAR AREA : Posterior lateral eyes relatively small, their long diameter equal to or less than the distance between the anterior and posterior laterals. Anterior medians elevated on a rounded tubercle.

CHELICERAE with 6 teeth in the inner row below. In two immature examples there are only 5 on one side but 6 on the other; another immature specimen has 7 on one side, the sixth being small. In several young examples with the normal number of teeth the fifth is small.

PEDIPALP : Coxa without granules along the basal edge anteriorly (there may occasionally be 1 in the basal half but at some distance from the edge). A pair of basal spines on the tarsus inferiorly and 4 apical spines below on the tibia.

LEGS : Tarsi and metatarsi of first two pairs of legs scopulate to the base (on metatarsus II the scopula is absent on the outer side of the midline in its basal third). Tarsus I with a single spine on its outer side, II with two short spines on the outer side, III with a group of spines in its distal half inferiorly mostly situated on the anterior side. Metatarsus I with 3 apical spines inferiorly and 4 or 5 on the lower surface, II with 3 apical and 6 or 7 on the lower surface, III with about 8 or 9 anterodorsal spines exclusive of those on the distal edge and 11 or 13 posterodorsal spines, and with a few slender spines inferiorly, IV numerous spined along the anterior surface inferiorly and with 2 posterodorsal spines. Tibia I and II, each with a single strong apical spine below, III with a single apical spine inferiorly or none at all, with 4-7 anterior spines, 3 very strong dorsal spines and 2

on the posterior side distally, IV with 2 apical spines inferiorly one being very weak and with a single spine on the posterior surface above. Patella III covered with short stout spines on its anterior surface, the dorsal surface with 1 or 2 spines, IV with several short spinules on its anterior side situated quite at the base of the segment. Claws of first pair of legs with about 6 teeth in each row: of fourth leg occasionally both muticous, more often only one is muticous, but often both are toothed in which case there are 2 outer and 3 inner, or 3 outer and 2 inner, or 3 outer and 4 inner teeth on each claw. The ventral surface of some of the coxae has a dense clothing of long setae: this is specially pronounced along the whole posteroventral border of coxa III where it is well marked distally, also to a less extent over the whole ventral surface of coxa IV.

POSTERIOR STERNAL SIGILLA ovoid, about two-fifths to one-half of a long diameter distant from the sternal margin and about two-thirds or scarcely more than half a diameter apart, their distance apart at any rate greater than their distance from the sternal margin.

Apical segment of *Posterior Spinners* about $1\frac{1}{2}$ times the length of the penultimate segment.

MEASUREMENTS: Total length 23 mm., length of carapace 6.8, breadth of same 4.8.

REMARKS: This species occurs at Alicedale along with a smaller one which I refer to *P. lateralis* Purc. (Trans. S. Af. Phil. Soc. XI p. 357) described from Dunbrody. The two can at once be distinguished by the dentition of the chelicerae, the smaller species having 8 in the inner row margining the fang groove: the posterior sternal sigilla are also quite different in the two species. The only other species described from this part of S. Africa are *P. coloniae* Poc. (Ann. Mag. Nat. Hist. 7.X. p. 12) from Jansenville and *P. o'neili* Purc. (Trans. S. A. Phil. Soc. XI. p. 357) from Dunbrody, species which are only known to me through the descriptions: from *o'neili* I distinguish this species in the absence of granules along the basal inferior edge of the coxa of the pedipalps and in the size of the posterior lateral eye: from

coloniae in the dentition of the chelicerae, that species having 7 teeth on the fang groove (according to Mr. A. S. Hirst in lit.).

Very few characters found in this genus can be regarded as of specific importance. I think that the degree of development of the setae along the posteroventral border of coxa III will prove useful in this respect.

The two species of *Pelmalorycter* found at Alicedale make quite different types of nests. *P. lateralis*, according to Mr. Cruden, has the tube of the nest bifurcated, both arms projecting upwards out of the ground; *P. crudeni* also has the tube bifurcated, but one arm ends blindly below the surface of the ground and only one projects above ground.

GENUS STASIMOPUS.

The females of the South African genus *Stasimopus* are the largest of our trap-door spiders. They are abundant in most parts of the subcontinent, south of the Limpopo, and are referable to many forms, here called species. The great majority of the known species are confined to the Cape Province, a fact which is perhaps connected with the greater diversity of physical environment found in that area; it should be added however that the Transvaal and Free State species have not been so carefully collected as those of the Cape Province.

For the most part these species seem to have each a separate and distinct area of distribution but we do not know the limits of any of those areas nor to what extent they overlap. As a rule only one species occurs in any limited geographical area: the Grahamstown *Stasimopi*, for instance, are all referable to *schönlandi*, those of Victoria West and neighbourhood all to *maraisi*, and the Alicedale individuals seem to belong to a single species. Nevertheless in some localities two species are known to occur. Dr. T. F. Dreyer has pointed out the occurrence of two quite distinct species at Bloemfontein, two species are known from Debe Nek and I believe that two occur at Kroonstad. In such cases it seems probable that the two species will prove to be topographically separated from each other but on this point I have obtained

very little data : Dr. Dreyer writes that one of the Bloemfontein species, *S. oculatus*, is very local in that neighbourhood, being known to him only from a very small area where the soil is exceedingly hard, whilst another species is more generally distributed.

On the other hand I believe that two forms of the same species may occur together without such topographical separation: for instance, the specimens of *S. insculplus* collected by Mr. Pym indiscriminately at Kingwilliamstown may or may not have spines at the apex of the third metatarsus inferiorly—a character sometimes of specific value in this genus but not so in this species as various grades of intermediates between the two conditions are met with. An intensive study might conceivably shew that these are instances of the true-breeding homozygous forms described by Prof. Bateson as the only definable units of classification (Presid. Address Brit. Ass. Adv. Sci. 1914), yet even if such be the case the existence of the numerous grades of intermediates, mongrels as they are termed by Bateson, must make it impossible in practice to utilise them as units of classification.

The characters employed in distinguishing the various species are all somewhat variable even in specimens taken from the same locality and with the advent of more material from different parts of the country it becomes increasingly difficult in certain cases to draw a hard and fast line between the various species. The group *insculplus*, *artifex*, *umlaticus* and *kentanicus* is one which I think will ultimately have to be regarded as a single species unless it is found that the several forms can be maintained on the male characters. Judged by the female characters, *schönlandi*, *astutus* and *pateronae* can only be regarded as varieties of a single species for they intergrade somewhat, yet the adult males of *astutus* and *schönlandi* seem to be very distinct. Another group of closely related forms is constituted by the species, *schreineri*, *palpiger*, *leipoldti* and *maraisi*.

One is inclined to suspect that the genus will prove to be composed of a very great number of local forms : whether those forms grade throughout the genus or whether they can be arranged

into natural groups of a strictly specific value is not yet known. At any rate what we now distinguish under the name of species are probably to be regarded as the most marked of such local forms. Unfortunately, the finer problems of variation and distribution cannot be attempted merely through a study of female characters.

Various species of *Stasimopus* have been founded on adult male examples alone, and it has not been possible in all cases to match them with known females. The adult males afford more systematic characters than do the females and it is possible that the structural differentiation into distinct forms has been carried on still further in the males than in the females, as is the case in the related order Solifugae.

Although the males of 14 species are known and appear to be very distinct, yet in no species is the range of variation amongst the males ascertained: in nearly every case the description of the male has been based on a single specimen. The males of the following species have been described: — *S. insculptus* Poc. (A.M.N.H. 7. 7. p. 285); *S. palpiger* Poc. (A.M.N.H. 7. 10. p. 9.) [The female is unknown to me and I think that referred to *palpiger* by Dr. Purcell (Ann. S. Af. Mus. III p. 85) really belongs to some other species, perhaps *astutus*. This species is no doubt near to *S. schreineri* Purc.] : *S. nigellus* Poc. (A.M.N.H. 7. 10. p. 319) female unknown : *S. schreineri* Purc. (Ann. S. Af. Mus. III p. 21) : *S. brevipalpis* Purc. (Ann. S. Af. Mus. III p. 75) : *S. robertsi* Hewitt (Ann. Transvaal Mus. II p. 75, also Rec. Alb. Mus. II p. 412) : *S. erythrognathus* Purc. described by me (Rec. Alb. Mus. III p. 32) : *S. qumbu* Hewitt (Rec. Alb. Mus. III p. 31) : *S. schönlandi* Poc. described by E. Strand (Zeitschr. Nat. Halle a S. 79, 1907 p. 178) and by me (Rec. Alb. Mus. III p. 27) : *S. astutus* Poc. a male from Bedford described by me (Rec. Alb. Mus. III p. 28) : *S. patersonae* Hewitt ? sp. 2 males from Alicedale described by me (Rec. Alb. Mus. III p. 30) : *S. gigas* Hewitt (Annals Natal Mus. III pt. 2) supposed female described in this paper : *S. minor* Hewitt (Annals Natal Mus. III pt. 2). [The female is unknown. This species is near to *S. nigellus* Poc. but is at once distinguished through the

greater length of the palp. Since describing the type specimen I have received another example from Bloemfontein (Dr. Dreyer) in which the anteromedian eyes are only about a diameter apart so that the wide separation of these eyes is perhaps not a character which can be utilised in distinguishing the species from *nigellus* Poc.] : *S. steynsburgensis* Hewitt (Annals Natal Mus. III pt. 2) female unknown.

A key to the Cape Colony species of this genus, based on female characters, was given by Dr. Purcell in Annals S. Af. Mus. Vol III p. 85 but its value was somewhat impaired from the fact that the author was unacquainted with the species previously described by Mr. Pocock. In the following key the species are arranged somewhat arbitrarily under three sections which again have several subdivisions : these sections, however are not sharply defined and in using the key due allowance should be made for some degree of variation within a species.

Key to the species of the genus *Stasimopus* based on the characters of adult females.

- | | |
|---|---|
| <p>A
Group
of short
spinules at
base of tar-
sus of palp
superiorly
extending
from about
$\frac{1}{3}$ to $\frac{1}{2}$ of
the length
of the seg-</p> | <p>(a) Tibia I shorter than the metatarsus, armed with 5-9 spines on its inner surface. Tibia of palp with a small distal group of stout spinules above. Posterior median eyes small, smaller than the anterior medians, a diameter or more distant from the posterior laterals. (Worcester).
<i>S. erythrognaethus</i>, Purc.</p> <p>(b) Tibia I slightly longer than the metatarsus, armed with 8-11 spines on its inner surface. Tibia of palp with a tiny distal patch of spinules above. Posteromedian eyes slightly larger than the anteromedians and about $\frac{1}{2}$ their own diameter distant from the posterior laterals. Metatarsus III with 15-16 spines on the anterior surface. (Willowmore).
<i>S. bimaculatus</i>, Purc.</p> |
|---|---|

ment.

Metatarsus I with a long band of spinules above extending from the base to beyond the middle of the segment.

(c) Tibia I subequal to the metatarsus, armed with 11-15 spines on its inner surface. Tibia of palp with a large distal group of spinules above extending over at least $\frac{1}{3}$ of the length of the segment. Posteromedian eyes very much larger than the anteromedians and almost touching the posterolaterals. Metatarsus III with 10-12 spines on its anterior surface. (Steinkopf.)

S. schultzei, Purc.

(d) Tibia I subequal to the metatarsus, armed with 20-23 spines on its inner surface. Tibia of palp with 8 or 9 minute apical spinules above. Metatarsus III with 22-24 spines on its anterior surface. Posterior median eyes a little larger than the posterior laterals and distant about $\frac{1}{2}$ a long diameter from them. Patch of red spinules on anterior side of patella IV occupying over $\frac{3}{4}$ of the length of the anterior surface. (Little Namaqualand?)

S. obscurus, Purc.

(e) Tibia I subequal to the metatarsus, armed with about 24 spines on its inner surface. Tibia of palp with only a few spinules distally and only very few or none are stout. Posteromedian eyes as long as or longer than the anteromedians, slightly more than $\frac{1}{2}$ a diameter distant from the posterolaterals. Metatarsus III with about 24 or more spines on its anterior surface. Patch of red spinules on anterior side of patella IV not occupying over $\frac{3}{4}$ of the length of the anterior surface. (Pretoria.)

S. robertsi, Hewitt.

*According to the description, this seems very much like the female of my *S. robertsi* from Pretoria. Probably the spinulation on the dorsal surface of the tarsus of the palp will distinguish them, though the character is not fully described in *obscurus*; in *robertsi* the spinules are not numerous but are very stout and strong, the patch extending quite 2-5ths of the length of the segment.

†*S. dubius* mihi, founded on a single specimen from Potchefstroom, is very closely related to *robertsi* and may prove identical therewith; it has somewhat fewer spines (19) on the anterior surface of metatarsus III.

B

Group of short spinules at base of tarsus of palps superiorly usually short and composed of only a few spinules, sometimes however extending about $\frac{1}{2}$ of the length of the segment or even a trifle more.

BAND OF SPINULES ON UPPER SURFACE OF METATARSUS I LONG, EXTENDING OVER $\frac{1}{3}$ TO $\frac{1}{2}$ OR EVEN MORE OF THE LENGTH OF THE DORSAL SURFACE.

(f) Inferoposterior apical tuft of metatarsus IV composed of a single large stout spine, usually flanked on one side or both by 1-3 more slender spines or spiniform setae. Metatarsus III with a group of apical spines below. (Hanover, also known to me from De Aar and Hopetown.)

S. unispinosus, Purc.

(g) Apical tuft of metatarsus IV composed of about 5 or 6 subequal setiform spines. Metatarsus III without a group of apical spines below. Tibia of palp with some short stout spinules distally above. (Kroonstad.)

**S. coronatus*, sp. nov.

(h) Some stout spinules at apex of tibia of palp above and a cluster of spines at apex of metatarsus III inferiorly: distal patch of spines on dorsal surface of tibia I extending about $\frac{1}{5}$ or $\frac{1}{6}$ of the length of the segment. (Bloemfontein, O.F.S.)

S. oculatus, Poc.

(i) A cluster of spines at apex of metatarsus III inferiorly but no stout spinules at apex of tibia of palp above: distal patch of spines on dorsal surface of tibia I extending about $\frac{2}{5}$ of the length of the segment. (Middledrift, C.P.)

S. spinosus, Hewitt.

(= *S. schönlandi* var. *spinosus*.)

The following species have no spines at the apex of metatarsus III inferiorly and with rare exceptions no stout spinules at the apex of the tibia of the palp above: the distal patch of spines on dorsal surface of Tibia I extends about $\frac{1}{8}$ - $\frac{1}{6}$ of the length of the segment:—

(j) About 9-20 spinules in the basal patch on the

*A single specimen from Mafeking (Bro. J. H. Power) agrees closely with this species,

B—Cont.

tarsus of the palp above : tibia I with a band of 5-10 spines on its inner surface : ocular area wider than the length of tibia I, post-lateral eyes small, subequal to or only slightly larger than the post-medians. (Swellendam and Robertson div.)

S. brevifalpis Purc.

(k) Like the preceding but post-lateral eyes much larger than the post-medians : width of ocular area equalling or slightly less than (rarely greater than) the length of tibia I. (Montagu, C.P.)

**S. quadratimaculatus* Purc.

(l) Basal patch of stout spinules on tarsus of palp above almost obsolete : tibia I with a band of 17-23 short spines on its inner surface : width of ocular area subequal to the length of tibia I. (Modder Riv., C.P.),†

S. fowleri Hewitt.

Some specimens of *S. schönlandi* Poc. might be included in this column : see B. II.

II.

BAND OF SPINULES ON UPPER SURFACE OF METATARSUS I OF MODERATE LENGTH, EXTENDING OVER ABOUT $\frac{1}{4}$ TO $\frac{1}{3}$ OF THE DORSAL LENGTH OF THE SEGMENT.

(1) Ocular area very wide, its width behind equal to the length of metatarsus I together with $\frac{1}{2}$ or more of the tarsus. See B III for *S. leipoldti*.

(2) Width of ocular area equal to length of metatarsus I together with $\frac{1}{3}$ or more of the tarsus; posterior lateral eyes very small.

See B III for *S. maraisi*.

*The characters of the palp are unknown to me, being omitted from the original description.

†Specimens from Bloemfontein and from Valseh Riv. near Kroonstad, are barely distinguishable from this species except in size.

B-Cont. (3) Width of ocular area barely or not exceeding the length of metatarsus I; posterior laterals at least as large as the posterior median eyes. (m) (f).

(m) Some spinules at the apex of the tibia of the palp (Kroonstad, O.F.S.). *S. dreyeri*, Hewitt.

The following species are without spinules at the apex of the tibia of the palp.

(n) Distance between the two lateral eyes on each side at least twice the long diameter of the posterior, and that between the anterior median and lateral about twice the diameter of the median. No spines at apex of metatarsus III inferiorly. (Grahamstown, C.P.). *S. schönlandi*, Poc.

(o) Distance between the two lateral eyes on each side about equal to the long diameter of the posterior; anterior laterals much larger than anterior medians, the space between them less than the diameter of the medians. Spinous areas on palp and first two pairs of legs slightly shorter than in *schönlandi*. (Pearston and Jansenville, C.P.) **S. astutus*, Poc.

(p) Metatarsus III with a group of spines or spiniform setae at the apex inferiorly. Distance between anterior median and anterior lateral eyes greater than the diameter of the medians but not equal to twice the diameter of the medians. (Perseverance, C.P.) *†S. patersonae*, Hewitt.

III.

BAND OF SPINULES ON UPPER SURFACE OF METATARSUS I SHORT, EXTENDING OVER ABOUT $\frac{1}{6}$ OR LESS OF THE DORSAL LENGTH OF THE SEGMENT.

Ocular area very wide, its width behind equal to the length of metatarsus I together with $\frac{1}{2}$ or more

*This species may sometimes fall under B III.

†A very closely related form, which in some respects connects together *schönlandi*, *astutus* and *patersonae*, occurs at Alicedale, C.P.

B-Cont. of the tarsus; posterior row of eyes strongly recurved, (*q*) and (*r*).

(*q*) Patella III with a number of slender dorsal spines at the apex in addition to the stout ones along the anterior surface. Tibia of palp with spinules at the apex above. (Hanover). [This or a very closely related species is also known to me from Somerset East Dist. and from Redhouse.] *S. schreineri*, Pure.

(*r*) Patella III without any slender dorsal spines at the apex. (Clanwilliam.) *S. leipoldti*, Pure.

Ocular area as wide as length of metatarsus I together with about $\frac{1}{3}$ of tarsus; posterior lateral eyes always considerably smaller than the posterior medians.

(s) Patella III without any slender dorsal spines at the apex. (Victoria West.) **S. maraisi*, Hewitt.

Ocular area about as wide as or slightly narrower than the length of metatarsus I; posterior lateral eyes usually about as large as or even larger than the posterior medians. (*l*)—(*z*).

1. No spinules at apex of tibia of palp above, nor spines at apex of metatarsus III inferiorly.

(*t*) Metatarsus IV spined along the middle below. (Pt. Elizabeth.) *S. castaneus*, Pure.

(*u*) Metatarsus IV not spined along the middle below; patch of spinules at apex of tibia I dorsally subequal in length to the patch at the base of metatarsus I. (Qumbu, C.P.) †*S. qumbu*, Hewitt.

*This species sometimes falls under B II. All our specimens of *S. maraisi* have only 4 teeth in the outer row of the fang groove, whereas most species of the genus have five or more teeth thus situated. The character is not constant in most species, for whereas normally the row is composed of 5 or 6 teeth of more or less equal size, not infrequently there are more, large and small ones being interspersed in the row; often the tooth nearest to the base of the fang is small. Juvenile examples of various species have only 4 teeth in that row.

†This species also occurs at Ngqeleni (H. L. Bulcock).

B-Cont.

(v) Patch of spinules at apex of tibia I dorsally only about half the length of that at the base of the metatarsus. (Vredefort Rd.) **S. gigas*, Hewitt.

2. No spines at apex of metatarsus III inferiorly, but tibia of palp with spinules at the apex above.

(w) Patella III with a number of short stout red spinules at apex above similar to those on the tibia. (Umtata, C.P.) *S. umtaticus*, Purc.

(v) Patella III with the distal dorsal spines black and finely pointed at the apex or setiform. (Kentani, C.P.) †*S. kentanicus*, Purc.

3. Tibia of palp with spinules at the apex above, and metatarsus III with a cluster of spines at apex inferiorly (latter character sometimes wanting in *insculplus*).

(y) Long diameter of anterolateral eyes less than distance between anterolateral and anteromedian eyes. (Kingwilliamstown, C.P.) *S. insculplus*, Poc.

(z) Long diameter of anterolateral eyes greater than distance between anterolateral and anteromedian eyes. (Rokeby Park, near Grahamstown, C.P.) ‡*S. artifex*, Poc.

Ocular area only $2\frac{1}{2}$ times as wide as long.

(z¹) Tibia of palp with spinules at the apex above but no spines at apex of metatarsus III inferiorly. (Kentani dist., C.P.) *S. kolbei*, Purc.

**S. astutus* may sometimes fall in this section but is easily distinguished from *gigas* by its ocular characters.

†*S. kentanicus*, Purc., seems hardly distinguishable from *S. insculplus*, Poc., if we include under the latter specimens which have no spines at the apex of metatarsus III inferiorly.

‡At Peddie there is a closely related form lacking the cluster of spines at the apex of metatarsus III. This connects together *artifex* and *insculplus*.

C	BAND OF SPINULES ON UPPER SURFACE OF METATARSUS I EXTENDING ABOUT $\frac{1}{3}$ MORE OR LESS OF THE LENGTH OF THE SEGMENT.
No distinct spinules at base of tarsus of palp superiorly.	Metatarsus IV without inferoposterior apical tuft of stout setae or spines, or if present not closely approximated to form a compact comb. (Natal.)

S. rufidens, Auss.

Specimens of S. poweri which may be referable to this section can be distinguished from rufidens by the presence of a well developed comb of spiniform setae at the apex of the metatarsus IV. See B I.

Stasimopus poweri, sp. nov.

TYPES: Five female examples collected at Modder River near Kimberley by Bro. J. H. Power who presented them to the Albany Museum.

COLOUR: Carapace and appendages castaneous; abdomen more or less infuscated above.

CARAPACE: Ocular area not so wide as the length of Metatarsus I but subequal in width to the length of Tibia I. Distance between anterior lateral and anterior median eyes slightly less than the long diameter of the former, between anterior and posterior lateral eyes subequal to or greater than the long diameter of the former and considerably greater than the long diameter of the latter. Posterior medians oval, their distance from the posterior laterals greater than their long diameter. A longitudinal line touching the outer margin of the anterior lateral would pass through the interspace between posterior median and posterior lateral.

PEDIPALP: Band of spines on inner side of tarsus extending to near the base and including about 9 or 10 strong spines. Basal patch of spinules on tarsus above almost or quite obsolete, being composed of a few spinules usually more or less elongated and not very stout, or even none at all. No spinules at the distal end

of the tibia above (except in one specimen where there are a couple of weak ones).

LEGS : Inner surface of Tibia I with 17-23 short spines, the upper surface with a small apical patch of spinules scarcely extending over one-eighth of the length of the dorsal surface. Basal patch of spinules on Metatarsus I above extending over about two-fifths of the length of the dorsal surface (in the smallest specimen only one-fourth). Basal patch of spinules on Metatarsus II above about twice as long as that at the apex of the tibia. Inner surface of tibia II with 6-10 spines. Anterior surface of metatarsus III with a band of 16-25 spines. Patella III with about 10-15 short spines on its anterior surface : some very weak short spines at the distal end above. Metatarsus III without an apical tuft of spines below : a few long more or less spiniform setae may be present. Infraposterior apical tuft on Metatarsus IV composed of about 8-10 spiniform setae arranged in a transverse row.

Tibia I shorter than Metatarsus I.

MEASUREMENTS : Total length 41.3 mm. ; length of carapace 15.2 ; breadth of same 12.6 ; length of metatarsus I 5.9.

This is a particularly large species rivalling in size *S. rufidens* of Natal. A very closely related form is known to me from various localities in the Free State [Bloemfontein (Dr. T. F. Dreyer), Valsch Riv. near Kroonstad (Prof. H. H. W. Pearson) and from Winburg (Miss S. Brown).]

***Stasimopus dreyeri*, sp. nov.**

TYPE : A single female example from Kroonstad presented to the Albany Museum by Dr. T. F. Dreyer.

COLOUR : Carapace castaneous, appendages dark castaneous, abdomen somewhat infuscated over the median area above

CARAPACE : Ocular area subequal in width to the length of the first metatarsus. Distance between anterior and posterior lateral eyes very slightly greater than the long diameter of the former and about $1\frac{1}{2}$ times the long diameter of the latter, between anterior lateral and anterior median eyes subequal to or very

slightly less than the long diameter of the former. Posterior medians oval, their distance from the posterior laterals subequal to their long diameter.

PEDIPALP: Band of spines on inner side of tarsus extending to the base, including about 16-18 spines, tibia with 2 or 3 spines and patella with none on the inner side. Basal patch of stout spinules on tarsus above extending about one-fifth or one-sixth of the length of the segment. A small patch of spinules at the distal end of the tibia above.

LEGS: Inner surface of tibia I with 24-26 short spines, the upper surface with a small apical patch of spinules extending over about one-sixth or one-seventh of the length of the dorsal surface. Basal patch of spinules on metatarsus I above extending over about one-fourth of the length of the dorsal surface. Basal patch of spinules on metatarsus II above scarcely longer than that at the apex of the tibia. Inner surface of tibia II with 12 spines. Anterior surface of metatarsus III with a band of about 27 or 28 short strong spines. Patella III with about 15 short spinules on its anterior surface and a small patch of weak spinules at the distal end above. Metatarsus III without apical tuft of spiniform setae below. Infero posterior apical tuft on metatarsus IV composed of 5 spiniform setae arranged in a transverse row. Patch of red spinules on anterior surface of patella IV extending over about two-thirds of the length of the anterior surface. Tibia I subequal to metatarsus I in length.

MEASUREMENTS: Total length 36 m.m.; length of carapace 11.75; breadth of carapace 10.3; length of metatarsus I 4.3 m.m.

A closely related form, differing however in the ocular characters, is known to me from Beerhaagte, Heidelberg Dist. (Transvaal Mus.).

***Stasimopus coronatus*, sp. nov.**

TYPES: Two female examples from Kroonstad presented to the Albany Museum by Dr. T. F. Dreyer.

COLOUR: Carapace and appendages dark castaneous. Abdomen pale above, only infuscated mesially behind, and dorsally over a comparatively narrow median area.

CARAPACE : Ocular area subequal in width to the length of the first metatarsus. Distance between anterior lateral and anterior median eyes about equal to the long diameter of the former ; between anterior and posterior laterals a little greater than the long diameter of the former and nearly twice as long as the long diameter of the latter : posterior medians rounded, their distance from the posterior laterals slightly greater than or subequal to their long diameter. [These ocular characters apply to the larger specimen only.]

PEDIPALP : Band of spines on inner side of tarsus extending almost to the base, including 9-12 spines ; tibia with 2 spines ; patella with none on the inner side. Basal patch of stout spinules on tarsus above extending about $\frac{1}{4}$ or very slightly more of the length of the tarsus. A small patch of spinules at the distal end of the tibia above.

LEGS : Inner surface of tibia I with 16-19 short spines, the upper surface with a small apical patch of spinules extending over about one-sixth of the length of the dorsal surface. Basal patch of spinules on metatarsus I above extending over about three-fifths of the length of the dorsal surface. Basal patch of spinules on metatarsus II above about twice as long as that at the apex of the tibia. Inner surface of tibia II with 6-9 spines. Anterior surface of metatarsus III with a band of 17-20 spines. Patella III with about 15 short spines on its anterior surface and a small patch of spinules at the distal end above. Metatarsus III without an apical tuft of spiniform setae below. Infero posterior apical tuft on metatarsus IV composed of 5 or 6 spiniform setae arranged in a transverse row. Patch of red spinules on anterior surface of patella IV extending over about $\frac{3}{4}$ of the length of the anterior surface. Tibia I very slightly shorter than Metatarsus I.

MEASUREMENTS : Total length 37 m.m., length of carapace 11.8 m.m., breadth of carapace 10.2, length of metatarsus of first leg 4.25.

Assuming the validity of this species as distinct from *dreyeri*, it may be noted that three species have been recognised in a very

limited amount of material collected in the immediate neighbourhood of Kroonstad.

This species is very closely related to my *S. dubius* from Potchefstroom and *S. robertsi* from Pretoria. I distinguish it therefrom in the shorter length of the band of spinules on the upper surface of the tarsus of the palp.

***Stasimopus gigas*, Hewitt (?) sp.** (Annals Natal Mus. III pt. 2.)

The following description is based on a large female specimen in the British Museum collection taken at Vredefort Rd. by Capt. Barrett Hamilton. It is possible, however, that this specimen should be referred to *nigellus* Poc:—

OCULAR AREA: Very slightly narrower than the length of metatarsus I. Posterior laterals small, smaller than the posterior medians, their distance from the anterior laterals about twice their long diameter. Posterior medians and posterior laterals rather widely separated, their distance apart equal to the long diameter of the former. Distance between anterior laterals and anterior medians appreciably greater than the diameter of the median, subequal to the diameter of the lateral.

PEDIPALP: Tibia without spinules at apex above. Tarsus with a small basal group of spinules above. Band of spines on inner side of tarsus extending to the base and including about 20-24 strong spines.

LEGS: Metatarsus I with basal patch of spinules on its upper surface extending over about one-fifth to one-sixth of the length of that surface, nearly twice as long as the patch at apex of tibia I above. Basal patch of spinules on metatarsus II above about $1\frac{1}{2}$ times as long as that at apex of tibia II above. No spines at apex of metatarsus III inferiorly. Comb on metatarsus IV composed of about 5 strong spines and several weaker ones. Anterior surface of metatarsus III with a band of about 34 spines. Metatarsus IV not spined along the middle below. Tibia I measured dorsally slightly shorter than metatarsus I. Inner surface of tibia I with about 30 or 32 spines. Inner surface of tibia II with 14-17

spines. Patella III with 10-12 spines on its anterior surface but no spinules at the distal end above, only relatively long spiniform setae.

MEASUREMENTS: Total length 36 m.m., length of carapace 14.8, breadth of carapace 12.5, length of metatarsus 15.6.

FAM. OONOPIDAE.

Section O. LORICATAE.

Gamasomorpha australis, sp. nov. (Text fig. 2.)

The types of this species were taken by myself during November, 1914, in Gowie's Kloof, Grahamstown, where the species is common.

CARAPACE finely striolated at the sides, with a broad smooth mesial area. A few hairs arise from each side of this area but the strongest hairs are 4 or 6 arising from rather conspicuous bases arranged in a transverse line which constitutes the ill-defined boundary between the upper surface and the sloping posterior surface of the carapace. Clypeus broader than the width of the anterior row of eyes. Anterior eyes separated from each other by a distance about equal to one-half of their long diameter. The four posterior eyes in a very slightly recurved line, the medians appreciably larger than the laterals and slightly separated therefrom.

Dorsal abdominal scute in the female large, subovate, broadest behind, the hind margin rounded; the surface very lightly convex, hairy and rather coarsely punctured throughout: it covers the abdomen entirely though the spinners may or may not be visible in dorsal view. That of the male is similar but narrower and more elongated. Ventral scute of female smaller than the dorsal but the general outline of its shape is similar: posteriorly however it is shallowly emarginate. It is clearly composed of two portions, an epigastric shield anteriorly and an abdominal shield posteriorly: it is separated from the infra-mammillary scute. The tracheal stigmata are widely separated. The surface is beset with numerous short hairs and is punctured, but not so coarsely as the dorsal

scute. The ventral shield of the male is narrower and longer, reaching as far as the infra-mammillary scute, but not fusing therewith : moreover the two halves are completely fused and there is no thickening nor groove to mark the division between epigastric and abdominal portions. Surface hairy and finely punctured, but anteriorly at the sides roughened and more coarsely punctured. Tracheal stigmata as in the female.

Maxillae very obliquely inclined, thickened along their inner margin, similar in the two sexes. Labium with a concave anterior margin.

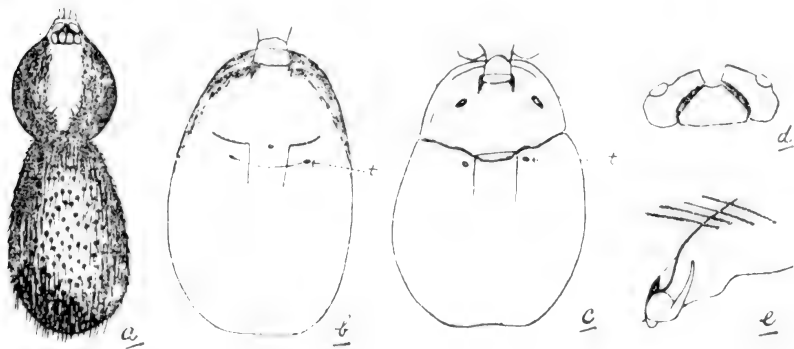
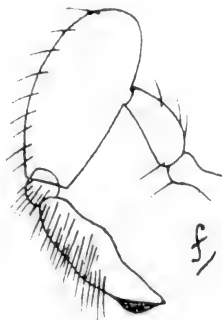


Fig. 2.—*Gamasomorpha australis*, sp. nov.

- a. Male from above.
- b. Abdomen of male in ventral view, *t* being the tracheal stigma.
- c. Abdomen of female in ventral view.
- d. Labium and maxillae of male.
- e. Distal portion of tarsus of male palp.
- f. Male palp.



Legs muticous. Anterior tarsi about three-fifths as long as the metatarsi. Tarsi and metatarsi of legs and tarsi of palps with stout hairs which are finely ciliated, some of them only along one side. Tarsal claws of fourth leg with only a single row of

well-developed teeth, the distal row of reduced teeth distinct though small in the male, apparently quite absent in the female. The well-developed row includes 6 long and strong teeth in the female, the row reaching nearly to the apex of the claw: in the male there are only 4 strong teeth and the row reaches about half way along the claw.

Tarsus of palp in the female not terminating in a sharp point. In the male, the patella of the palp is swollen and elongated, the femur being attached at a point about two-fifths of the distance along one side. Tibia small and rounded. Tarsus elongated, about three-fourths to four-fifths as long as the patella, but not nearly so stout, carrying on its upper surface a number of stiff ciliated hairs which however do not occur near the apex of the segment: the bulb is very small, situated at the distal end of the tarsus and only discernible under high magnifications (one-eighth ins. obj.) and even then is easily overlooked as its walls are transparent whilst both bulb and style are closely adpressed to the tarsus: the style is short and does not project outwards.

Total length 2 mm.

The genus *Gamasomorpha* is recorded in Simon's "Histoire naturelle des Araignees" from various parts of the old and new worlds, but not from Africa and there are no subsequent records of the genus in S. Africa at any rate. Mn. Simon has however described a closely related genus, *Nephrochirus*,* from Wallish Bay. *G. australis* differs from any of the species mentioned by Simon (l.c.) in the peculiarly modified male palp which resembles that of some species of the genus *Opopaea* excepting in the very small size of the bulb.

***Australoonops*, gen. nov.**

The spider now described under the name of *Australoonops granulatus* sp. nov., falls under the section "Oonopidae molles" but does not seem to be referable to any of the genera hitherto included therein. The ocular arrangement is much more like that

*Jenaische Denkschriften XVI, p. 178.

of the "Oonopidae loricatae" than of the typical genera of the unarmed section, and one is inclined to suspect that when the various genera are better known it will not seem advisable to arrange them under sections differing only in the presence or absence of a shield. The ocular characters, the absence of spines on the legs, and the shape of the labium, furnish the characteristic features of this genus.

***Australoonops granulatus*, sp. nov. (Text, Fig 3.)**

TYPE: A single adult male example from Grahamstown, July 1913 (R. Godfrey and J. Hewitt).

CARAPACE: High, strongly convex, obliquely sloping behind, nearly one-third longer than broad: surface closely granulated throughout, and bearing dorsolaterally a number of scattered hairs which, however, are not found on the lower portions of the lateral surfaces nor on the posterior obliquely sloping surface. Ocular area occupying the greater portion of the frontal width, wider than



Fig 3. -*Australoonops granulatus* sp. nov.
Pedipalp and labium of male. Ocular area in dorsal view.

the clypeus. Eyes rather large; posterior row in a very slightly recurved line, the medians, which are larger, being contiguous and only narrowly separated from the laterals. Anterior laterals considerably separated from each other.

STERNUM: Elongated, considerably longer than broad, subovate, its surface marked with numerous elongated pale spots: the posterior coxae are well separated.

LABIUM : This appears to be continued anteriorly as a very narrow median colourless process, the margins of which are obscured by downwardly directed stiffish hairs; including its process the labium is much longer than broad.

LEGS : The two anterior tarsi and tibiae are not spined but scattered stout setae occur on all the legs. Anterior patellae about two-thirds as long as the tibiae. The fourth femora are appreciably longer than the femora of the other legs but are not stout.

PEDIPALPS : The maxillae are obliquely inclined to each other. None of the segments of the palp are swollen with the exception of the tarsus. The femur is about as long as the patella and tibia together but not quite so long as the tarsus. The bulb is not distinct from the tarsus : from a lateral protuberance of the tarsus the spine arises and passes more or less parallel with the long axis of the segment, terminating just beyond the end of the tarsus : it is fairly stout and straight, but hooked near the tip. Numerous hairs arise from the tarsus on the side away from the bulbal region.

TOTAL LENGTH : 2 m.m.

FAM. DRASSIDAE.

Gen. XEROPHAEUS Purcell.

X. poweri, sp. nov. (Text fig. 4).

Types : An adult male and female from Kimberley collected by Bro. J. H. Power.

COLOUR : Carapace in both sexes and abdominal scute in male castaneous, chelicerae dark reddish brown : surfaces of body and appendages covered with silky hairs, pale yellowish on the carapace, pale brown on the abdomen.

MALE : Carapace narrowed in front. Anterior row of eyes moderately procurved, the medians large and almost touching the laterals : posterior row a little wider and rather more strongly procurved, the medians about one-third of a diameter, or less, apart and very slightly more than a diameter distant from the

smaller lateral eyes. Lateral eyes on each side about a diameter or slightly less apart.

Chelicera with 3 superior teeth, the middle one largest, but only 1 minute inferior tooth.

Legs : All the tarsi and the two anterior pairs of metatarsi scopulate to the base except the fourth tarsus where scopulae are absent in the basal sixth : the third metatarsus also has a thin scopular strip on each side, anteriorly extending the whole length of the segment, posteriorly only in the distal half : fourth metatarsus with a row of scopular hairs distally on each side. The fourth tarsal scopula is broadly divided, the third only narrowly so. Tibia I with 2 apical spines below, metatarsus I with a pair of basal spines below.

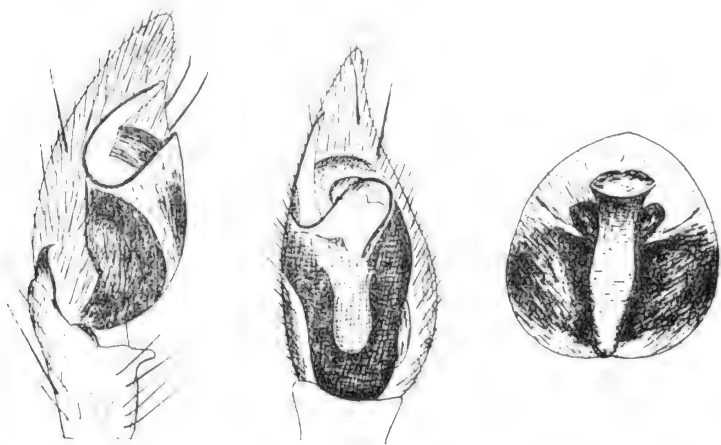


Fig. 4. *Xerophaeus poweri*, sp. nov. Palpal organ of male and epigyne of female.

PEDIPALPS : The tibia and its process together slightly longer than the patella but much shorter than the tarsus. Tibial process very much shorter than in *X. capensis* Purcell : it is moderately stout at the base, tapering gradually distally and ending in a claw-like extension which is broad and flattened at its base where it is

marked off by a slight constriction from the rest of the process, quickly tapering towards its apex which is strongly hooked and dark castaneous in colour. The claw is not quite so long as the rest of the process.

Tarsus large, acuminate, the distal portion projecting less than one-third of the total length beyond the cavity containing the palpal organ. On the exposed surface of the palpal organ in its distal half there is a brown well marked S shaped chitinous band which basally margins a deep groove on the surface of the palpal organ and at its distal end tapers to a fine point and terminates freely not far from the apex of the tarsus, beyond the bulbal excavation. Another process also arises from the bulbal organ : this is whitish, very delicate and is apparently a thin-walled tube : it arises near the distal loop of the S, and though in its basal half is quite separated from that chitinous band yet distally the two become associated and terminate together.

FEMALE : All the tarsal and metatarsal scopulae are divided. Tibia I with a scopula on each side in its distal half. Tibia I and Metatarsus I spined as in the male.

Epigyne with a broad shallow mesial longitudinal groove, terminating anteriorly in a small pocket, and bounded on each side by dark brown convexities, the groove being whitish. The mesial area is not grooved throughout, being raised and convex near its posterior end. The convexities of either side consist of a small prominent one anteriorly and a much larger one posteriorly connected together by a narrow bridge.

MEASUREMENTS : Total length of male 11 m.m. of female 14 m.m.

This seems to be a very distinct species. It is probably more closely related to *X. spiralifer* Pure. from Hanover than to any other described species. It approaches the genus *Scotophaeus* in that the anterior row of eyes is not strongly procurved, but it clearly belongs to Dr. Purcell's section I of his genus *Xerophaeus* (Ann. Mag. Nat. Hist. 7-20, p. 314).

Xerophaeus gordonicus, sp. nov. (Text fig. 5.)

TYPE : A single adult female from N.W. Gordonia collected by Mr. C. A. Anderson. This species is related to *X. poweri* from which it differs in the following respects :—

EPIGYNE with the median area not marked off into a continuous well defined tract but broken into two isolated parts, a short anterior portion which is grooved and ends in front in a small pocket and a pale quadrilateral posterior portion which is strongly raised and is almost entirely surrounded, except mesially in front and behind, by deeply pigmented areas. Between these two portions the mesial area is not marked off in any way from the lateral parts of the plate. The dark brown convexities, confined to the posterior half of the epigyne, present anteriorly on each side a deep pit from which a groove passes posteriorly towards the genital cleft.

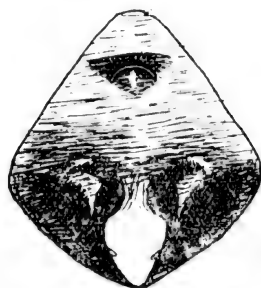


Fig. 5.—*Xerophaeus gordonicus*, sp. nov.
Epigyne of Female.

EYES : Anterior row in a very slightly procurved line : posterior row slightly procurved, the medians about $\frac{1}{2}$ a diameter apart.

CHELICERA : With no inferior tooth : 3 superior teeth, the middle one large, distal one of moderate size, basal one very small.

LEGS : Metatarsus I with 2 basal spines : tibia I with 3 spines in the inferior row, the distal half with a narrow scopular band on the inner side.

TOTAL LENGTH : 12.75 mm.

This species is perhaps very near to *X. hollentolus* Purc. from Steinkopf (Jena. Denkschr. XIII p. 236 Pl. XI fig. 17). In that species the genital plate is described as densely granular at the sides whereas such is not the case in *gordonicus* where, however, the sides of the epigyne are beset with numerous hair pits.

***Xerophaeus anomalus*, sp. nov. (Text fig. 6.)**

TYPE. An adult female example from Grahamstown collected by Mr. K. Graham (Jan. 1910).

OCULAR AREA. Anterior row of eyes slightly recurved in dorsal view, posterior row practically straight. The posterior medians are about $1\frac{1}{2}$ diameters apart and nearly 2 diameters distant from

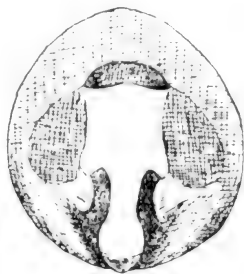


FIG. 6. *Xerophaeus anomalus*, sp. nov. Epigyne of female.

the postero-laterals. Distance between anterior lateral eyes and anterior margin of carapace about $1\frac{1}{2}$ times the diameter of an eye.

CHELICERA with an inferior tooth of moderate size.

TIBIA of first leg with 3 strong spines below, 1 at the base, 1 at the apex and one about the middle of its length.

EPIGYNE somewhat resembling that of *X. spiralifer*, Purc., from Hanover (Ann. Mag. Nat. Hist. 7. 20, p. 319, Pl. XIV, fig. 25) but differing in that the pale median area is not grooved, the anterior pocket is wider, and the two anterior convexities do not exist as such in this species whilst the posterior ones are not very pronounced: further, the epigynal plate extends considerably in advance of the anterior pocket, which apparently is not the case in *spiralifer*. The median portion in the hind half of the epigyne is convexly raised: in the anterior half it is flat.

COLOUR. Carapace and appendages brownish black but bearing ashy grey hairs; abdomen pale brown being thickly covered with pale silky hairs. Patella of fourth leg reddish brown, and the patellae and more distal segments of the preceding legs have a reddish brown tinge.

TOTAL LENGTH 7.5 mm.

But for the fact that the epigyne agrees with the type found in Dr. Purcell's section I of his genus *Xerophaeus*, I might have hesitated to include this species in that genus, for the ocular area differs from that of any other *Xerophaeus* in our collection or of any of the described species apparently.

***Diaphractus kalaharicus*, sp. nov. (Text fig. 7.)**

TYPE. A single adult female from N. W. Gordonia presented to the Albany Museum by Mr. C. A. Anderson. This species differs from *D. leipoldti*, Purc. (Ann. Mag. Nat. Hist. 7.20, p. 313), from the Clanwilliam dist., in the following respects:—

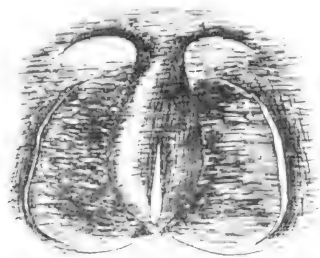


FIG. 7. *Diaphractus kalaharicus*, sp. nov. Epigyne of female.

Carapace not depressed. Distance between posterior median eye and posterior lateral quite $2\frac{1}{2}$ times the diameter of the former. Metatarsus I without basal spines below. Tibia I without spines inferiorly or with only 1 at the apex. Tibia I scopulate in its distal half on the inner side and to a slightly less extent also on the outer side. Epigyne with a well-marked convex mesial area, broader behind, narrower and strongly raised in front, and on each side a shallow excavation bounded laterally by a well defined

curved and strongly projecting ridge : anteriorly, near the constricted portion of the median area, the lateral excavation leads into a deeper pocket with well defined inner and anterior walls. The convex mesial area shews no trace of a keel, but there is an unpigmented median strip in its hinder half.

Total length 12.5 mm.

Melanophora albanicus, sp. nov. (Text fig. 8 b)

TYPE : A single adult female collected in the neighbourhood of Grahamstown by Master C. Sole (July, 1901). This species seems to be closely related to *M. gooldi* Pure. from Malmesbury Div. and to *M. cromwrighti* Pure. from Hanover and Worcester (Ann. Mag. Nat. Hist. 7 20. p 330. Pl. XV figs 53 and 54) but differs therefrom in the epigyne. In *albanicus* the mesial area marked out by the curved groove of the epigyne is very much narrower

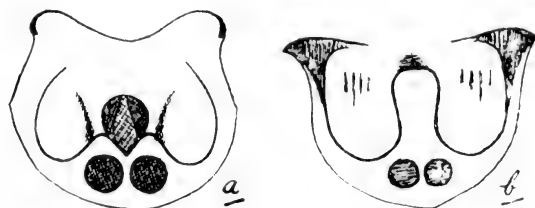


Fig. 8.—*Melanophora fuliginoides*, sp. nov. (a)
Melanophora albanicus, sp. nov. (b)
 Epigyne of female.

than the lateral areas, the mesial area in its narrowest part, posteriorly being scarcely more than half as wide as the lateral area : whereas in the abovementioned species the mesial area appears to be at least as broad as the lateral area.

COLOUR : Blackish almost throughout, the ventral surface of the abdomen being quite black : lung opercula yellow, and greater portion of epigyne yellowish.

CHELICERA with only 1 inferior tooth.

TOTAL LENGTH : 7.25 mm.

Melanophora fuliginoides, sp. nov. (Text fig. 8a.)

THE TYPE of this species is a single adult specimen from Grahamstown (J. Hewitt). It is closely related to *M. redunca* Purc. and *M. montana* Purc. differing therefrom in the epigyne (see fig.). The most obvious difference lies in the form of the curved groove which crosses the epigyne from side to side and which laterally is more or less parallel to the sides of the plate but mesially is bent into a well marked acute angle. *M. fuliginosa* Purc. (Ann. Mag. Nat. Hist. 7. 20. Pl. XV fig. 44) is somewhat similar in this character but differs in details, the epigynal plate in that species being bifid posteriorly, and broadest anteriorly. The anterior lateral eyes are very much larger than the anterior median eyes, the distance between the lateral eye and the anterior margin of the carapace being slightly less than the long diameter of the eye: the posterior lateral eyes are slightly larger than the posterior medians, and moreover the posterior median eyes of *fuliginoides*, are convex and very slightly nearer to the laterals than to one another whereas those of *fuliginosa* are flat and at any rate not nearer to the laterals than to one another. Viewed from above, the anterior row of eyes is in a slightly recurved line: they are said to be strongly procurved in *fuliginosa* but presumably this can only be when viewed from in front.

CHELICERA with 2 small inferior teeth.

FIRST METATARSUS with 1 weak spine near the base below.

GENERAL COLOUR: Brownish black.

TOTAL LENGTH: 5.5 mm.

FAM. ZODARIIDAE.

Cydrela spinifrons, sp. nov.

TYPE. A single adult female example collected recently in the neighbourhood of Kuruman by Sergeant F. A. O. Pym, Curator of the Kingwilliamstown Museum.

COLOUR: Carapace and appendages pale yellowish brown; abdomen blackish brown with pale markings as follows: a shallow A-shaped band arranged transversely on its upper surface in the

middle portion of its length, followed by four somewhat indistinct transverse stripes; laterally and inferiorly in the posterior half of the abdomen is a pale broad band which in front is directed towards the **A**-shaped mark on the dorsal surface whilst posteriorly the bands of each side unite just in front of the vent.

CARAPACE. Eyes rather large and closely spaced. Antero-medial eyes largest, a trifle more than half a diameter apart, about four-fifths of a diameter distant from the anterolaterals and about one and a half diameters distant from the posteromedians; posteromedians a trifle less than a diameter apart and about one and a half diameters distant from the posterolaterals. Hind margins of the posterior row of eyes in a slightly recurved line. Surface of carapace quite smooth. Seen from above, the carapace on its supero-anterior margin presents a distinct fringe of rather short spines which project forwards horizontally; this fringe lies above the anterolateral eyes but below the anteromedians. Short sub-spiniform setae occur over the whole of the clypeus.

ABDOMEN. The hairs on its surface are slender.

LEGS. Tarsus IV almost two thirds as long as the metatarsus. Patella IV with 8—10 spines on its anterior surface, 5—6 spines on its dorsal surface, and 3—5 spines on its posterior surface. At the distal end of femur IV superiorly is a transverse row of about 5 strong spines, and similarly situated on all the preceding femora there are several somewhat weaker spines. Tibia II with 6 spines on its anterior surface.

TOTAL LENGTH: 11 m.m.; length of carapace 5 m.m.

This species is different from any known to me in the spinous anterior fringe of the carapace: the ocular arrangement is distinctive in the close approximation of the eyes to each other.

Order SCORPIONES.

Parabuthus scobinifer, sp. nov.

TYPE: A single male example from N. W. Rhodesia in the British Museum collection presented by Dr. L. Colyer. The specimen is perhaps immature.

COLOUR : Yellowish throughout, except the vesicle which is dark brown and the fifth caudal segment which is brown : also the ocular tubercle and the lateral eyes on each side are infuscated.

CARAPACE : Posterior breadth considerably greater than its length. The surface rather coarsely granular throughout, very closely so in the cephalic portion anterior to the median eyes. Ocular tubercle granulated above except on the superciliary ridge which is smooth.

ABDOMINAL TERGITES : The anterior six are finely granular anteriorly, coarsely so posteriorly : The seventh is rather coarsely shagreened in its mesial area between the median keels but the shagreen does not fuse into long transverse ridges and the area presents no trace of a median groove. The anterior portion of the mesial area is granulated and so are the sides of the tergite, the granules between the median and lateral keels of either side being considerably smaller than the shagreen on the mesial area.

LAST ABDOMINAL STERNITE with no trace of median keels, the mesial area entirely smooth but a few granules occur on the mesial side of the lateral keel : the position of the lost median keels is marked by two coarse pits on each side. Lateral keels crenulated : between each keel and the lateral margin of the sternite the surface is fairly closely granulated.

TAIL : First segment wider than the fourth. Middle lateral keel of fourth segment strong and well developed in its posterior half but weak in its anterior half where it almost merges in the general granulation of the lateral surface. Middle portion of superior crest of fifth caudal segment quite obliterated but posterior as well as anterior portions of this keel are present : accessory crest weak, composed of three rather widely separated small low tubercles, the anterior one being smallest. Posterior segments thickly granular at the sides and below. Vesicle appreciably narrower than the fifth caudal segment, excavated at its base above, but not very deeply, and the margins of the excavation are not defined.

Upper surface of first caudal segment broadly but not deeply excavated from side to side, the shagreened area extending to the

posterior end of the segment: the area is coarsely shagreened posteriorly and along the whole length mesially except just in front, but the sides of this area in its anterior half and the anterior margin are rather coarsely granulated: in no place does the shagreen fuse into continuous transverse ridges: the area is narrowest at a point about one-fourth of its length distant from the posterior margin. At the anterior margin of this area the upper surface of the segment suddenly descends almost perpendicularly. The second segment is also excavated above, the median groove being a trifle deeper and distinctly narrower than that on the first segment: the granulated area is composed of moderately fine granules, the area being triangular in shape and terminating at a point distant from the posterior margin of the segment about half the length of the granulated area.

HAND short and stout, wider than the brachium which latter is about two and a half times its greatest width.

PECTINES with 36-37 teeth.

MEASUREMENTS: Total length 68 m.m. Length of carapace 6.6, of hand 11.3, of fifth caudal segment 7.5; breadth of carapace 8, of hand 3.

This species connects the section including *P. flavidus* Poc., *P. truculentus* Hirst, etc., with that including *P. transvaalicus* Purcell.

ADDENDUM.

Whilst this paper was being printed a third species of *Pelmatorycter* was received from Alicedale. This may be described as follows:—

Pelmatorycter flavidofusulus, sp. nov.

The specific name assigned to this form has reference to the yellow colouration of the numerous small projecting papillae on the ventral surfaces of the spinners. The type is a female specimen collected at Alicedale by Mr. F. Cruden (March, 1915).

COLOUR. Carapace and appendages pale olive brown,

Abdomen pale with several faint dark cross-stripes above, and anteriorly near the waist with a dark dorsal blotch.

OCULAR AREA. Posterior laterals oblique, decidedly longer than the distance between an anterior lateral and posterior lateral. Distance between an anterior median and anterior lateral scarcely equal to the diameter of a median. Posterior row distinctly wider than anterior row : anterior margins of posterior row in a straight line.

CHELICERAE with 10 teeth in the inner row below : the basal tooth is comparatively large, but the next one is small and the remainder shew a successive increase in size in passing from the basal to the distal end of the row.

PEDIPALPS. Coxae without spinules on the antero-inferior edge. Tarsus with a spine on each side inferiorly in its basal half, also a pair inferiorly situated in the distal half. Tibia with 4 apical spines below, and 2 elongated spines on each side inferiorly.

LEGS : Metatarsus I thinly scopulate, the scopula absent from the basal half on the posterior side and not continued quite to the base on the anterior side : Scopula of metatarsus II almost obsolete on the posterior side and present only in the distal third on the anterior side. Tarsus I with a single weak spine near the apex inferiorly ; II with 1 or 2 spines inferiorly on the posterior side near the apex ; III with 3 spines inferiorly in the distal half, also 1 on the anterior side and 1 dorsally. Metatarsus I with 3 apical spines inferiorly and 2 on the lower surface ; II with 3 apical spines and 2 or 3 on the lower surface ; III with 7 anterodorsal spines, 8 posterodorsal spines, 3 at the apex inferiorly and 2 along the anterior edge ; IV with 4 spines at the apex inferiorly, also 8 on the lower surfaces and 2 postero dorsal spines. Tibia I without an apical spine below or with only a very weak elongated spine ; II with a distinct spine at the apex inferiorly ; III and IV with a pair of apical spines inferiorly ; III also with 3-5 spines on its anterior surface, 3 on the dorsal surface and 2 near the supero posterior edge near the apex ; IV also with several elongated setiform spines on the inferior surface. Patella III with about 14 stout spines on its anterior surface, the dorsal surface with 2 spines

on its posterior edge ; IV without short spinules at the base on its anterior side but stout spiniform setae occur there, some of them being comparatively short though all gradually taper to a fine point. Coxa III without a dense clothing of setae on its postero-ventral border.

POSTERIOR SPINNERS : Apical segment very slightly shorter than the penultimate segment. The small papillae on the ventral surface of the spinners are translucent and amber coloured, looking at first sight like innumerable glistening drops of liquid : they are best seen under a compound microscope but can be just distinguished through a strong hand lens. Each of these papillae carries a hair.

POSTERIOR STERNAL SIGILLA pearshaped, about six-fifths of a diameter apart and from half to three-fifths of a diameter distant from the sternal margin.

MEASUREMENTS : Total length 16.5, length of carapace 5.5, breadth of carapace 4 m.m.

This species is at once distinguished from that provisionally referred to *P. lateralis* Purc. or from *P. crudeni* sp. nov. in the dentition of the chelicerae, also in the shortness of the apical segment of the spinners. The cross striping of the abdomen, though faint, may also prove a distinctive character.

Notes on Siphonaptera in the Albany Museum, Grahams-town, South Africa, with descriptions of two new species of the Genus *Ischnopsyllus* (*I. isomalus* and *I. grahami*),

BY JAMES WATERSTON, B.D., B.Sc.

The small collection of fleas in the Albany Museum, on which through the courtesy of the Director I have the privilege of reporting now, has been in my hands for some time with other ectoparasites from the same source. But I have hitherto refrained from recording this material in the hope that it would receive such accessions as would make the collection more representative of the siphonapterous fauna of the Grahamstown district.

As there seems to be no immediate prospect of this hope being realised and as the collection has an importance disproportionate to its size, I have thought it best to offer the following notes and descriptions.

The 31 examples submitted from time to time by Mr. Hewitt, include 9 spp. of which 2 are new to science. Of the 7 known forms 2 belong to the genus *Xenopsylla* and the host attachment is in each instance noteworthy, *X. cheopis* Rothschild, occurring on the rare Bontebok, an antelope of extremely limited range, and *X. nubicus* Rothschild, on a bat. The remaining species call for less remark. They are all apparently widely spread in South Africa.

As on former occasions, I have to express my indebtedness to the Hon. N. C. Rothschild, M.A., who has determined one critical example and who further concurs as to the novelty of the species described below.

I have also to thank the Carnegie Trust for the use of a dissecting microscope,

GENUS ECHIDNOPHAGA, Olliff.

Echidnophaga, Olliff, Pr. Linn. Soc. N.S.W. (2) i. p. 172 (1886).

Echidnophaga gallinaceus, Westw. (1875).

Sarcopteryx gallinaceus, Westwood, Ent. Mo. Mag. xi. p. 246 (1875). 1 male, 5 females. *Mus. rattus*, Lin., Grahamstown, Dec., 1912.

GENUS XENOPSYLLA, Glink.

Xenopsylla, Glinkiewicz, Sitzber. Akad. Wiss. Wien. cxvi. I. p. 381, t.i. (1907).

Xenopsylla cheopis, Rothsch. (1903).

Pulex cheopis, Rothschild, Ent. Mo. Mag. (2) xiv. p. 85 no. 4, tab. 1, fig. 3, 9; tab. 2, fig. 12, 19 (1903).

2 females. Bontebok, *Damaliscus pygargus*, Pall., a fresh skin sent by Dr. J. D. Albertyn from Bredasdorp, March, 1912.

Xenopsylla nubicus, Rothsch. (1903).

Pulex nubicus, Rothschild, Ent. Mo. Mag. (2) xiv. p. 84, no. 2, tab. 2, fig. 10, 16 (1903).

1 female. Among parasites taken on two species of bats, viz. *Miniopterus* sp. and *Rhinolophus, angur* K. And. found in cave at Pretoria, Oct. 1910.

For this identification I am indebted to Mr. Rothschild.

GENUS CHIASTOPSYLLA, Rothsch.

Chiastopsylla, Rothschild, Ent. xliii. no. 563, p. 105 (1910).

Chiastopsylla rossi, Waterst. (1909).

Ceratophyllus rossi, Waterston, Ent. Mo. Mag. (2) xx. p. 271, pl. v. figs. 3, 4 (1909).

1 male. *Mus rattus*, Lin., Grahamstown, 9th Oct., 1913.

4 males, 2 females. *Myiromys albicaudatus*, Smith. Grahamstown, R. Graham, Sept., 1913.

1 male. *Otomys irroratus*, Brants. Grahamstown, Sept., 1912.

1 male. *Crocidura flavescens*, Is. Geof. Grahamstown, Hewitt, 3rd July, 1913.

GENUS LISTROPSYLLA, Rothsch.

Listropsylla, Rothschild, Ent. Mo. Mag. (2) xviii. p. 175 (1907).

Listropsylla agrippinae, Rothsch. (1904).

Ceratophyllus agrippinae, Rothschild, Novit. Zoolog., xi. p. 634. pl. xii. fig. 56, 57., pl. xiii., fig. 62, 64., Sept. (1904).

4 males, 1 female. *Mystromys albicaudatus*, Sm. Grahamstown, R. Graham, Sept. 1913.

GENUS DINOPSYLLUS, Rothsch. and Jord.

Dinopsyllus, Rothschild and Jordon, Novit. Zoolog. vol. xx. p. 561. Oct. 1913.

Dinopsyllus ellobius, Rothsch. (1905).

Ctenopsyllus ellobius, Rothschild, Novit. Zoolog. vol. xii., p. 490, no. 9, t. 14, fig. 13, 15 (1905).

1 male. *Mystromys albicaudatus*, Sm. Grahamstown, Sept., 1913. R. Graham.

GENUS LEPTOPSYLLA, Rothsch.

Leptopsylla, Rothschild, Nov. Zool. vol. xviii., p. 85. June (1911).

Leptopsylla musculi, Dugès (1832).

Pulex musculi, Dugès Ann. Sci. Nat. xxvii. p. 160 (1832).

1 male, 3 females. *Mus rattus*, Lin. Grahamstown, J. Hewitt, 9th August, 1913.

1 male. *Mus rattus*, Lin. Grahamstown, 9th Oct., 1913.

GENUS ISCHNOPSYLLUS, Westw.

Ischnopsyllus, Westwood, Ent. Mo. Mag. i. p. 359 (1833).

Ischnopsyllus isomalus, sp. nov. (Text fig. 4, 5).

Head: Rather more than one and a half times as long as deep; not so much rounded as sloped from the upper edge of the antennal groove to the lower angle of the frons. Subparallel to the frontal edge a row of minute bristles, about 10 on each side. Of the two heavy chitinous pre-oral flaps the posterior is the longer and apically the broader.

Beginning above the flaps and stretching backwards to the level of the 2nd antennal joint is a group of minute spines (12 - 14) triangularly arranged. Between them and the row subparallel to the frons is a single bristle. One moderately long bristle on anterior edge of antennal groove before apex of 1st joint and a second very strong and reaching back well over the fore coxa, at the insertion of the 3rd joint.

The genal edge is heavily chitinized and undulated. It joins the anterior edge of the antennal groove at a somewhat sharp angle. The genal process thus formed shows a clear median area.

Antenna: 2-3 short bristles at the posterior angle of segment 1 and before the club a fringe of 5-6 hairs.

Occiput: Bordering the lower half of the antennal groove about 12 minute bristles in 2 rows, 5 short heavy bristles or spines on edge between antennal groove and lower posterior angle of the head. The upper surface of the occiput bears 9-10 bristles (in 2 rows) on each side and there is the usual posterior row of strong bristles (10) alternating with very minute weak bristles. In the maxillary palpus the proportional lengths of the joints are:—35, 20, 16, 27. In the labial palpus the proportions are:—20, 10, 10, 13, 18. The first joint being much wider (18) than its successors (11). Maxilla short, barely equal to 1st and 2nd joints of its palpus.

Prothorax: Tergite, about three rows of bristles may be reckoned before the comb, (a) 4 irregular (b) ante-median, 12, and (c) 8 post-median. Row (c) is remarkable in possessing fewer units than (b) but the place of the lowermost long bristles is occupied on each side by a patch of 4 minute bristles.

The comb consists of 23 teeth.

Sternite: bare.

Meso thorax: Tergite, about 4 rows can be reckoned containing in all about 34 bristles, a few minute bristles irregularly arranged near postero-lateral angle. Near the posterior edge there rise, apparently from below, 9-10 peculiar thin appressed equidistant spines or scales which have been already remarked

upon in the descriptions of *I. aegyptius*, Rothsch. and *I. ashworthii*, Waterst. Proximally these structures show no definite pustule or point of origin. They seem to be fused on their basal portion with the tergite but their extreme tip at least is free and sometimes projects backwardly.

Mesosternum : Sternite, bare, episternite 4+5 short strong bristles. Epimeron, 7 bristles of which 3 are at the upper, and 2 are at the posterior edges respectively and two are centrally placed. Spiracle exposed.

Melathorax : Tergite, 3 rows, about 26 bristles, those of the post-median row the strongest, comb of 20 spines.

Sternum : Sternite—one strong bristle at upper posterior angle—practically on the incassation, episternite with 3 spines. Epimeron with 10 spines arranged 3, 3, 2 and 2 at the distal edge of which the longer is superior in position.

Abdomen : In general the unmodified tergites bear two rows of bristles of which the first goes through the stigma while the 2nd contains the stronger elements. Tergite 1 however may be described as showing 3 rows. Tergites, i, ii, iii, iv, bear combs of teeth. The sternites, 2-6 bear one row. The chaetotaxy is as follows :—

Tergites ...	...	i	ii	iii	iv	v	vi	vii
1st row	...	4, 12	16	18	16	14	15	13
2nd row	...	8	15	15	15	14	14	12
Comb teeth		13	15	11	7	—	—	—
Sternites...	...	—	10	6	6	6	6	4, 14

Modified segments(fig. 4) : The 7th sternite is posteriorly produced into two equal rounded lobes. The corresponding tergite bears in addition to the bristles detailed above one strong antepygidial bristle on a tubercle with one short bristle above and two below.

On the 8th tergite there are 5 bristles below the stigma, one being near the edge. At the upper posterior rounded angle there are three very strong but short bristles below, and five bristles ventral to this patch before the angle; of these one rises from the

under surface. On the proximal ventral upper surface there are 10 bristles in a group remote from the edge.

The 9th tergite is hairy (about 30) between the narrow stylets each of which terminates in a long bristle. There are 2-3 shorter bristles near the apex. Posteriorly the 9th tergite bears a fringe of about 12 bristles and beneath there is a minute bristle on each side of the anus.

Legs: I. The first coxa bears 6-7 short bristles on the anterior edge. From the apex backwards there are 4 strong bristles of which the 3rd is long. Thereafter up to the insertion of the coxa there are about 10 minute curved bristles on the posterior edge. The outer surface of the coxa bears nearly 60 bristles in about 10 transverse rows.

Trochanter with three short bristles on lower ventral aspect.

Femur: Outer surface nearly bare. Along upper edge 24 minute bristles in 2 rows. 1 short bristle below, near trochanter. 2 postero ventral sub-apical short bristles and 2 more, of which the lower is longer, between the sub-apical bristles and the long recurved upper posterior spine.

Tibia: 4 closely appressed fine ventral bristles and one stronger apically situated.

Close to the ventral edge in median $\frac{1}{3}$ are 2 short bristles; about 16 bristles arranged in two rows nearer the dorsal edge, which bears 8-9 long strong bristles of which 1, 2, 5 and 8 appear to be double. The tarsal joints are in the proportion 9, 11, 9, 5, 9. The first joint bears on the anterior or ventral aspect 4 closely appressed short bristles and one stronger and curved. Three pairs of more divergent bristles and one stronger apical, along the posterior edge; on surface are about 11 short bristles. 2nd joint much like the 1st, the marginal bristles being further apart. There are only 7-8 bristles on the surface. 3rd joint with 5 surface bristles. 5th joint with 4 stout marginal bristles—the first two longer than the second pair. 1 stout ventral bristle and 7-8 dorsal.

II. The second coxa is completely bare posteriorly. On the anterior half at the upper edge 3 minute bristles, and thence

(along the edge) to the apex a row of 8 short but strong curved bristles—the lowermost being double. About 8 bristles at apex or along adjacent edge, 3 being strong.

Trochanter with 5 ventral bristles.

Femur : Near the base below 2 double and 1 single bristle at edge. Along the upper edge 15 short spines which posteriorly tend to curve. There is a long strong recurved apical spine with another shorter at the side below, and 2 others between the apical spine and the 2 sub-apical ventral spines of which the second is longer.

Tibia : 7 strong short spines at posterior edge of which 1, 2 and 5 are double. There are also about 9 on the ventral edge—some being double. On the surface are three rows of bristles 5, 10, 10. The last row is on the extreme edge and its units alternate with the stronger bristles there.

The tarsal joints are in the proportion 20, 16, 11, 7, 10. 1st tarsal joint with 8 short appressed bristles (some double) on the anterior edge—the apical pair being much stronger. 10–12 on posterior edge—the apical one being long.

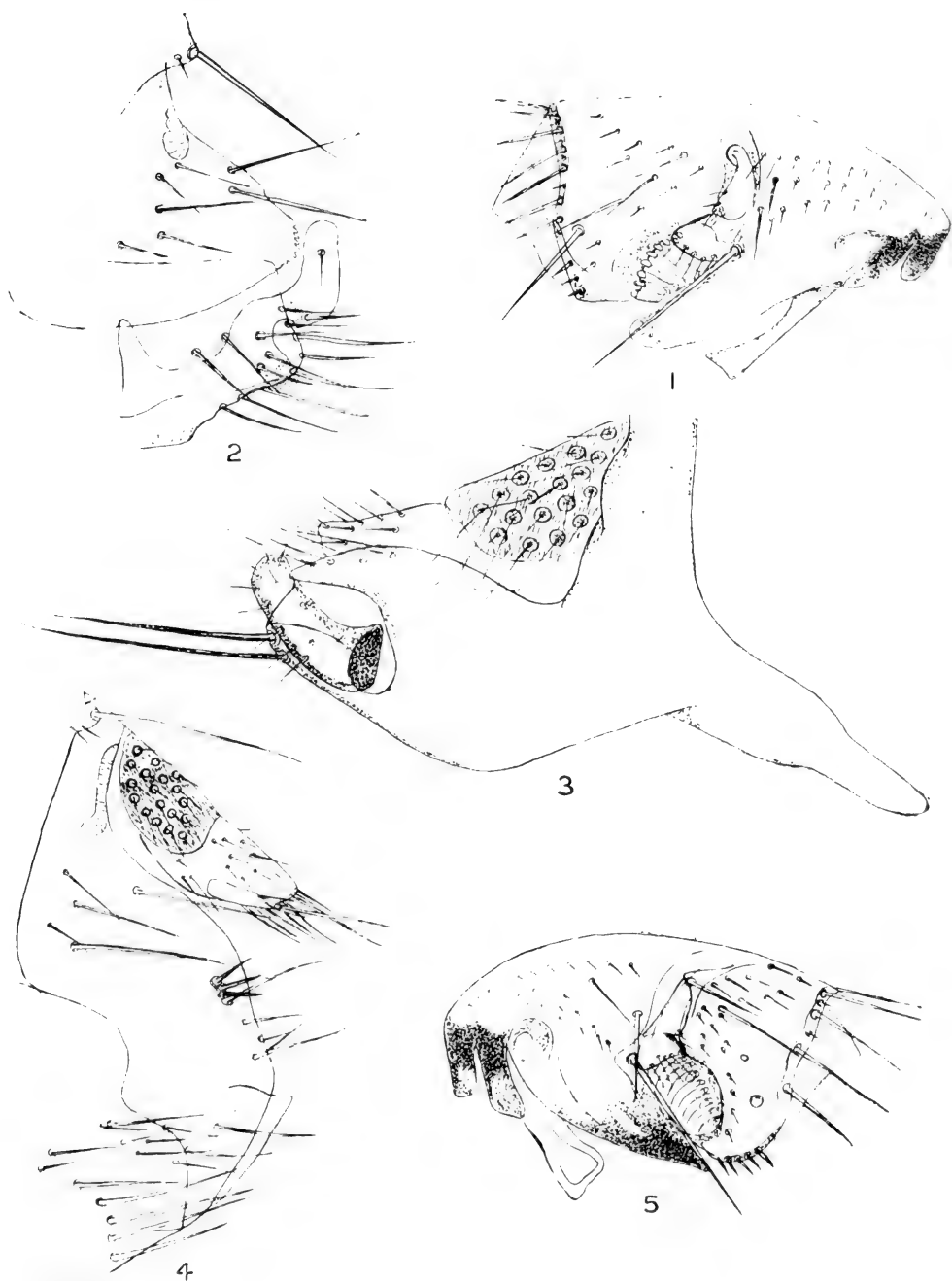
2nd tarsal joint bears at each side about 6 single or double bristles and about the same number of single bristles on each of the surfaces upper and lower. Joints 3–5 much as in forelegs.

III. The hind legs reproduce essentially the chaetotaxy of the middle legs, there being in certain regions more bristles as the surface is greater e.g. the upper edge of the hind coxa bears 18 short bristles instead of 15. The proportions of the lengths of the hind tarsal joints are, 28, 18, 13, 17, 12.

Total length of insect 2.35 m.m.

Type : One female in Albany Museum, Grahamstown, taken in a cave near Pretoria, October 1910. In the cave two bats occurred, viz., *Miniopterus* sp. and *Rhinolophus angur*, K. And. Possibly the *Miniopterus* is the true host as a species of *Ischnopsyllus** has already been described from *Rhinolophus angur*, K. And.

*Proc. Roy. Phys. Soc. Edin., vol. xix. no. 1. p.12 (I. Ashworthii, Waterst).



J. W. del.

TEXT FIGURE 1-5.
 ISCHNOPSYLLUS GRAHAMI, sp. nov. (1-3). ISCHNOPSYLLUS ISOMALIUS, sp. nov. (4, 5).

***Ischnopsyllus grahami* sp. nov.** (Text fig. 1-3).

Head : Frons with three rows (14, 4, 6) of minute bristles between the anterior angle and the antennal groove : 4 bristles on the anterior edge of the groove, viz., 1 almost at the base of the 1st joint, a second at the middle, and a third at the apex of the same. The fourth bristle rising at the insertion of the 3rd joint is strong and reaches back well on to the coxa.

The 2nd pre-oral flap is much longer than, and not so truncate as the 1st. Maxilla long, nearly equal to the first three joints of its own palpus. Labial palpus with joints 2-4 equal. The exact proportion of the segments of the rostrum is 20, 10, 10, 10, 16. The first joint is about $\frac{3}{4}$ as broad as long. In joint 2 the breadth—the length and this breadth is continued to the end of the rostrum. The proportions of the maxillary palpus are—32, 22, 14, 25. The oral edge undulated is produced backwards in a long obliquely truncated angle without any conspicuous clear median basal area.

Antenna : About 6-7 short hairs at apex of the 1st joint and 5-6 at the distal edge of the 2nd joint.

Occiput : 3 short spines at lower posterior angle, 5 short bristles in row parallel to the lower $\frac{2}{3}$ of the antennal groove. Above them a row of 4 stouter bristles of which the lowest and most posterior is strongest. The surface of the occiput bears besides 5 bristles on either side of the median line, where are also found one or two minute bristles. The normal posterior row, situated on the incrassation, contains 12 bristles more or less alternating with minute ones.

Prothorax : Pronotum. Ante-median row of 7 bristles and post-median of 8, with two minute bristles below the lowest strong bristle. The comb contains 26 spines which are rather noticeably sharp.

Prosternum bare.

Mesothorax : Row of minute bristles (14) below the pro-notal comb. Besides these, there are on the Mesonotum about 3 rows (7, 7, 7.) of bristles distinguishable, and about 13 sharp elongated scale like bristles below the posterior edge.

The Metasternum is bare on the sternite proper.

Episternite 5 bristles (3, 2); epimeron 4 (2, 2) the latter pair, at the apex of the sclerite, are thick.

Metathorax : Metanotum. Ante median row of 7 bristles with 2 in front medially, post-median row of 7 bristles on the incassation. The comb contains 26 spines.

Metasternum : Sternite 1, episternite 1, and epimeron 7. On the latter sclerite 4 bristles are on the surface and three at the upper posterior edge.

Abdomen : Tergites i-iv bear 2 rows of bristles and a comb of teeth. From v-vii there is one row of bristles on the tergites. Tergite 7 bears a long antepygial bristle on a tubercle with a minute bristle above and another below.

The detailed chaetotaxy is as follows :

Tergites	...	...	I	II	III	IV	V	VI	VII
1st row	...	...	5	6	6	-	-	-	-
2nd row	...	...	8	12	12	12	10	11	10
Comb...	...	...	8	25	24	15			
Sternites	...	...					
Rows ...	...	...		2	6	5	5	5	6

In the 2nd or post-median rows detailed above one bristle stands regularly on each side below the stigma. The teeth of the comb on segment 1 are only $\frac{1}{2}$ as long as those of the other combs and are much less acutely pointed.

Legs : I. *Coxa*. On the anterior edge are 7-8 short spines of which the last or apical one is long. On the posterior edge from the base to $\frac{3}{4}$, is a row of about 9 bristles the last being long. About 25 bristles on outer surface of coxa. Of these 2 sub-apically placed are long.

Trochanter : 2 ventral bristles.

Femur : 1 pair of ventral bristles at base, and one ventrally on each side of the apex. On the upper edge (from base to $\frac{2}{3}$) are about 12 minute bristles. One long recurved bristle at the apex above with a smaller before, also one bristle on outer apical surface.

Tibia : The anterior or ventral edge is bare except for an apical group of three strong bristles with one smaller in front. On the posterior edge there are 8 strong bristles with an equal number of smaller alternating bristles in a row almost on the edge. On the posterior half of the outer surface are about 6 bristles.

The joints of the first tarsus are in the proportion: 5, 6, 5, 4, 6.

The first joint is distinctly broader than its successors. The anterior edge is bare save for a sub-apical pair of bristles. Posteriorly there are at the edge a single bristle a median pair and a pair near the apex. On the surface are about 3 bristles.

The 2nd is similar to the first. There is, however, only one median and one apical pair of bristles on posterior edge. There are more bristles (6) on surface.

The 3rd and the 4th joints bear medianly an additional bristle on the anterior edge.

The 5th bears 4 stout spines at the sides and one ventral at about $\frac{1}{3}$.

II. The coxa is bare dorsally on the posterior half, but with three small bristles on upper inner aspect. At the upper anterior angle there is on inner aspect patch (5) of minute bristles. Near the anterior edge or on it there are 10 bristles, which increase in length near the apex of the coxa, 2 bristles on apical surface.

Femur : About 10 short bristles along the the upper edge, a pair ventrally near the base with a single bristle just beyond. One ventral apical bristle on each side, 2 bristles on outer apical surface behind the long recurved spine.

Tibia : 8 bristles along posterior edge—1 and 2 being double. The anterior edge is almost bare, though the usual pair of apical bristles is present. On the outer posterior surface are about 20 bristles (10, 10) in two rows of which one is practically on the edge.

The joints of the tarsus are in the following proportion :—
7, 4, 7, 11, 15.

The first tarsal joint has a short post-median bristle at the anterior edge and a pair apically. Along the posterior edge are 7 bristles (2 at the apex) and 11 on the surface.

The 2nd joint has about 7 outer superficial bristles.

Joints 3-4 have three posterior bristles and one anteriorly at the apex. There are 2-3 bristles on outer surface.

The 5th joint resembles that of the 1st tarsus.

III. The coxa is similar to coxa of II but there are no hairs on the inner apical surface of the posterior region; and there are both anteriorly and posteriorly on the upper edges 3 small bristles.

Tibia: There are here a few more hairs on the outer surface and three bristles, one being double, before the anterior apical spines.

The joints of the tarsus are in the proportion: - 9, 5, 9, 13, 21.

The tarsal joints are slightly more bristly than in the anterior tarsi. In particular there are two short spines on the ventral surface of the 5th joint at $\frac{1}{3}$ and another beyond.

Modified Segments: The 8th tergite is distally naked but medianly, behind the stigma, bears some 8 bristles of which 2 are strong. The corresponding sternite is remarkable in being fully developed though divided along the ventral line at a little beyond $\frac{1}{3}$.

Each half of the sternite bears 8 bristles situated round the distal ventral angle chiefly with about 6 behind.

9th tergite (fig. 3). The manubrium is apically narrowed, twice undulated on proximal edge, once distally. The clasper is strongly developed into three portions. There is an upper and a lower process connected by a thin film of chitin. At the base of the deep sinus so covered over the "finger" articulates.

The upper process bears internally about 6 hairs.

The "finger" in addition to several minute hairs bears a row of six on its distal or ventral edge. The upturned lower process bears two long and strong bristles.

The 9th sternite is hairy at the distal ventral angle. Its articulating process is somewhat short. The penis is very complicated. The internal plate is long and broad, reaching backwards to sternite 4.

Length of insect 2 mm.

Type of male in Albany Museum, Grahamstown, taken on *Eptesicus capensis*, Grahamstown, April 1913.

The species is named after Master Reginald Graham who collected many of the mammals on which the parasites recorded in this paper were found.

HOSTS AND PARASITES.

DAMALISCUS PYGARGUS, Pall.	Xenopsylla cheopis, Rothsch.
MINIOPTERUS, sp.	Xenopsylla nubicus, Rothsch.
RHINOLOPHUS AUGUR, K. And.	Ischnopsyllus isomalus, sp. nov.
EPTESICUS CAPENSIS, Smith.	Ischnopsyllus grahami, sp. nov.
CROCIDURA FLAVESCENS, Is. Geol.	Chiaestopsylla rossi, Waterst.
OTOMYS IRRORATUS, Brants.	Chiaestopsylla rossi, Waterst.
MYSTROMYS ALBICAUDATUS, Smith.	Chiaestopsylla rossi, Waterst.
	Listropsylla agrippinae, Rothsch.
	Dinopsyllus ellobius, Rothsch.
MUS RATTUS, Lin.	Leptopsylla musculi Dugés.
	Echidnophaga gallinaceus, West.
	Chiaestopsylla rossi, Waterst.

New Cretaceous Fossils from Brenton, Knysna.

By E. H. L. SCHWARZ.

[PLATES III AND IV.]

When I was engaged in making a geological survey of the Knysna Division I missed certain fossiliferous beds along the west bank of the Knysna estuary on the farm Brenton.* On learning that echinoderms and bivalve shells had been picked up by local people, Dr. Rogers visited the place and published a short account of the occurrence.† Recently I visited Knysna again and obtained several fossils from the beds, three of which are of special interest.

The fossiliferous beds were placed originally, in my report on Knysna, in the Enon beds; along the shore for about a mile, conglomerates similar in nature to the Enon beds on the east bank occur. Above these, and separated from them by a few inches of sandy clay, there is a conglomerate consisting of pebbles smaller than those in the lower beds and the matrix is largely made up of broken shells. The only form recognisable is a *Trigonia* which Dr. Rogers says is "very like *T. rogersi*," but with the better material I was able to obtain, I find that the form is specifically distinct. The specimen I obtained was lying loose at the foot of the cliff. Above this second conglomerate there are some 15 feet of bluish grey clays with very friable shells preserved in it. Large *Pernas* are common and their loosely lamigated shells led me at first sight to think they were inorganic calcareous deposits; with careful collecting, however, I was able to obtain fairly good specimens. The following is a list of fossils so far obtained: *Nautilus* sp.; *Acanthodiscus* sp.; *Belemnites* sp.; *Trigonia holubi*, Kitchin.;

*Geological Survey of the coastal plateau in the Divisions of George, Knysna, Uniondale and Willowmore; 10th Ann. Rept. Geol. Survey, Capetown, 1905.

†A. W. Rogers, 13th Ann. Rept. Geol. Survey, Capetown, 1909, p. 130,

Ptychomya complicata, Tate; *Meretrix uitenhagensis*, Kitchin.; *Perna* sp.; *Cidaris* sp.; *Pentacrinus* sp.; to which list I shall add the following new species: *Trigonia kitchini*, *Perna theseni*, and *Perna brentonensis*.

Mr. J. Rex of Deep Wall, Knysna, showed me a reptilian tooth from the beds which appeared to be that of a *Plesiosaurus*, but I was unable to secure it for closer identification.

In regard to the position of these blue clays of Brenton I am inclined to think that they belong to a higher horizon than the Uitenhage marine beds. Dr. Rogers states, (*loc. cit.*) that the fossils hitherto obtained show that the fauna of these beds is not identical with that of the Sunday's River beds in the Uitenhage area, but very like it, but he adds that the similarity justifies the inclusion of the Brenton beds in the Uitenhage series. Lithologically they are similar to the clays of Bethelsdorp and those at the mouth of the Zwartkops River near Port Elizabeth, which likewise are not connected with the more normal marine series further inland.* If we consider, however, the distribution of the Uitenhage beds, we can see that there must have been a difference in time between the deposition of the various deposits as they are now exposed. We find that there are three parallel rift valleys, in the hollows of which occur the remains of the once continuous covering of these Cretaceous deposits. Just as in the great rift-valleys of Central Africa, where the deeper portions are occupied by sheets of water, Lakes Tanganyika, Kivu, Albert Edward, and Albert and so on, and between them there is higher ground, so in our Western Province rift valleys the hollows occur filled in with gravels of the Enon series, but they are separated by stretches of the older rocks of the country. The nature of the rift valley is completely lost in these intervening stretches: denudation has done its work and the more superficial features of these trough faults has completely disappeared; nevertheless these series of basins mark the run of undoubted rift valleys of the same type as the

*Since writing the above Mr. H. P. Harper of Uitenhage has forwarded to me from his neighbourhood some very massive *Pernas* similar to, though not identical with, *P. theseni*; we must conclude, therefore, that the Brenton phase is definitely present in the Uitenhage area.

greater ones in Central Africa. Beginning with the coastal rift valley we have, occurring in pockets along it, the basins of Worcester, Robertson, Swellendam, Heidelberg, Mossel Bay, Knysna and Plettenberg Bay. Further inland there is the median rift valley, commencing in the west with the great double basin of Oudtshoorn, then continued to the east with the string of smaller basins along the Baviaan's Kloof River, and running out to sea with the basin in the valley of the Gamtoos River. Finally there is the innermost rift valley which has only one expansion still extant, that of Uitenhage itself, at once the largest and most complex of the series. This basin is shown in some geological maps passing eastwards to reach the sea at the mouth of the Bushman's River; actually, however, it ends at Alum Cave, some three miles east of the Port Elizabeth-Grahamstown road where it first strikes the Uitenhage basin.* From the fact that some of the original Enon Conglomerate rested on the 4000 ft. plateau between Oudtshoorn and Willowmore, in a region between two great water systems where denudation had always been small, it is evident that the base on which the Uitenhage System rested was a coastal shelf now 4000 ft. above sea level.

The Uitenhage beds resting in the middle rift valley were undoubtedly laid down on the 4000 ft. level, but I am now not so sure that the beds in the southernmost rift valley were.

Since working out the Geology of these Oudtshoorn and Baviaan's Kloof areas, I have had to deal with the Alexandria beds of Mio-Pliocene age and these have introduced a certain amount of uncertainty in regard to my previous work. The Alexandria beds rest on a stepped plain, a klimakotopiedion; the topmost step in this giant staircase is 1350 ft. above sea-level either at Sandflats, north of Port Elizabeth, or at Need's Camp, north of East London; from Sandflats, sea-wards, there is a succession of steps gradually descending to sea-level at Bethelsdorp and on these rest the Alexandria beds, identical in composition on the topmost as on the lowermost step or shelf. While these beds

*E. H. L. Schwarz, The Bushman River Cretaceous Rocks, Trans. Geol. Soc. S. Africa, Vol. XVI, Johannesburg, 1913, pp. 41-43.

were being laid down the land was rising, the sea cut back these shelves and laid down the material, shingle and shell banks, by which these beds are characterised. It is obvious, therefore, that the beds laid down on the lowermost shelf must be considerably later than those laid down on the uppermost, yet, except for a decrease in size of the typical shells as one goes downwards towards the sea, the nature of the beds and of the shells preserved in them is the same. Now it is quite possible that the Enon Conglomerates were laid down on a stepped plain of a similar character and that the deposits in the southernmost rift valley are slightly later than those inland. Palaeontologically there is not much to go upon: the collections of fossils from Brenton are too fragmentary to allow of accurate specific determination for the most part. The *Trigonia*, however, which is clearly related to *T. ventricosa* shows characters which lead one to infer that it is a species developed by the hastening to the adult state of the young forms of *T. ventricosa*, with the neanic characters preserved.

At Seal Point, Plettenberg Bay, at the top of the Enon gravels there are *Trigonia*s of Uitenhage species.

DESCRIPTION OF NEW SPECIES.

***Perna theseni*.** (Pl. III, figs. 4 and 5 and Pl. IV, fig. 1)

Description: Shell quadrate, very thick and lamellar, resembling *P. cephippium* of the West Indies, but the forward expansion is greater. Inner margin at the anterior end of the hinge descends more or less vertically and then sweeps round forwards at an angle of 105° . Ligament grooves closely set, a length of $1\frac{1}{2}$ inches contains $6\frac{1}{2}$ broad and 6 narrow grooves in the largest specimen. Lines of growth meet in an inverted V in the smaller grooves. Front margin of hinge makes an angle of 135° with the lower margin.

Dimensions: Greatest width of hinge 9.4 cm.; inner margin of hinge 5.9 cm.; approximate height 12 cm.; approximate width

12.5 cm.; width of broad grooves 0.4 cm.; width of narrow grooves 0.25 cm.

Named after Mr. Harold Thesen of Knysna, who took me to the locality and was the first to procure a recognisable specimen.

***Perna brentonensis*.** (Plate III, figs. 1, 2 and 3.)

Description : Shell oblique, very thick and lamellar. Inner margin at the anterior end descends at from 40° to 45° and then sweeps forwards in a slight curve. Hinge with deep grooves very irregularly developed, separated by perfectly plain surfaces. The deep grooves are often trumpet-shaped with wide openings towards the inner end and are separated by sometimes wide and sometimes by very narrow interspaces. The further characters of the shell are impossible for determination owing to the fragmentary state of the fossils as obtained, but as it is so clearly distinct from the former species, I have named it. In the hinge, a length of $1\frac{1}{2}$ inches contains $4\frac{3}{4}$ flat spaces and 4 deep grooves. Front margin of hinge makes an angle of 150° with the lower margin.

This species apparently would have been somewhat like *P. valida*, Stoliczka from the Ariyalur (Senonian) of Southern India, (1) it is entirely distinct from the small *P. altherstoni*, Sharpe, as redescribed by Kitchin(2). It is very like the Alexandria Mio-Pliocene form described by Newton as closely resembling the South American *P. gaudichaudi* (3) but the front inner margin in this form is straight and has not the forward curve which characterises the Brenton species, and which is also seen in *P. soldanii* from the Oligocene.

***Trigonia kitchini*.** (Plate IV, figs. 2, 3 and 4.)

This species belongs to the same group as *T. ventricosa*. It has the relative shortness, great height of outline and very strong anterior inflation of this species, but the coarse and salient character of the ornamentation on the anterior part of the shell are far

- (1). Cretaceous Fauna of B. India, Vol. III, p. 409, pl. XXII, fig. 1.
- (2). Annals S. African Museum, Vol. VII, p. 75, pl. II, fig. 9.
- (3). Records Albany Museum, Vol. II, pl. XIX, fig. 2.

less marked. In regard to the last point there is a distinct thickening of the ribs and slight tuberculation where these are found in *T. ventricosa*. This vertical height is less relatively to the breadth than in this species and the anterior width less. Thus—

	Height.	Breadth at 8th rib.	Width.
<i>T. kitchini</i>	6 (100)	4.25 (70)	2.6 cm. (43).
<i>T. ventricosa</i>	4.5 (100)	2.7 (60)	2.2 cm. (50).

The figures in brackets are the dimensions reduced to common factor, the height taken as 100.

It will be seen by these figures that the present species is more rounded and with less salient features than *T. ventricosa*; it is also about a third larger. Dr. Kitchin asked⁽⁴⁾ whether there were no forms intermediate between *T. ventricosa* and *T. kraussi*, which is a giant form of the former, but so far nothing of the kind has been discovered; the present species, however, is distinctly intermediate between *T. ventricosa*, to which group it belongs, and *T. rogersi* which is an elongated form, included, however, in the *Scabrae* division of the *Trigoniæ* like the others mentioned.

Description: The shell is very much shortened, half as high posteriorly as anteriorly. The valves are inflated at a vertical line beginning at the umbos and flattened in front of it. The umbos are situated at one-tenth the total length of the shell; they are prominent and are curved slightly backwards. The cardinal margin is straight and slopes down to the posterior margin which is lost. In front of the umbo the frontal border is moderately and regularly convex in outline and passes by a somewhat sharp curve into the lower border. This, as far as it is preserved, appears to have been practically straight.

The ribs from the earliest stages are inclined downwards on the front margin, but reach that margin horizontally in the later stages. On the flank, the earlier ribs take a slightly upward curve from the cardinal margin, but straighten out later and are inclined more and more downwards till about in the centre of the shell where they become vertical, with just a slight twist forwards

(4) F. L. Kitchin, "The Invertebrate Fauna and Palaeontological Relations of the Uitenhage Series." Ann. S. A. Museum, Cape Town, 1908, p. 97.

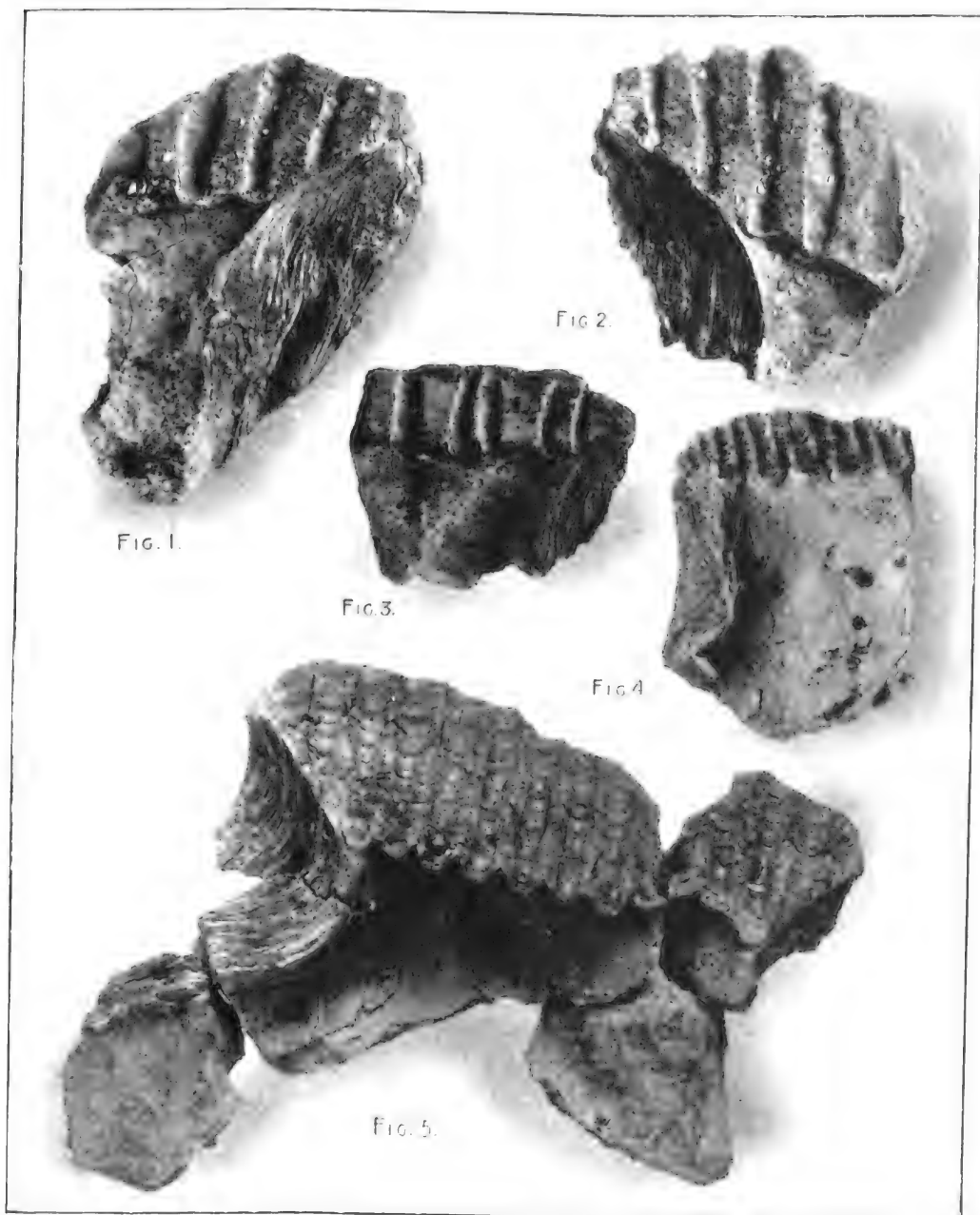
at the extreme end. From here the ribs are straight and inclined slightly backwards. On the flank, in the inflated portion, the ribs are broad and nodular but form sharp even crests posterior to this, and the lines of growth pass over them.

From the umbos there is a sharp carina which becomes flattened out, with a fold about 2 cm. from the umbos; its **only** ornamentation is the lines of growth. The area is about **equally** divided by a broad groove strongly marked by lines of growth. The escutcheon is very large, ornamented by beaded ridges which are inclined forwards from the cardinal margin, and are separated by about twice the width of the ridges.

Dimensions: Greatest height 6 cm.; length (estimated) 6.5 cm.; breadth (single valve) 2.6 cm.; greatest width of escutcheon 1.2 cm.; greatest width of area 0.6 cm.

The species is named after Dr. Kitchin who has described the South African Cretaceous fossils collected by the Geological Survey.

The specimens are preserved in the Albany Museum.



PERNA BRENTONENSIS *sp. nov.* (1, 2 and 3).
PERNA THESENI *sp. nov.* (4 and 5).





FIG. 1.



FIG. 2.



FIG. 3.



FIG. 4.

PERNA THESENI sp. nov. (1).

TRIGONIA KITCHINI sp. nov. (2, 3 and 4).

Sur un *Kalanchoe* Nouveau de l'Herbier de l'Albany
Museum de Grahamstown.

Par MONS. RAYMOND HAMET.

Kalanchoe Rogersii, Raymond Hamet.

Caulis erectus, robustiusculus, simplex, glaber. Folia opposita, decussata, petiolata, glabra; petiolus quam lamina brevior, latiusculus; lamina oblonga vel orbiculari-oblonga, crenata, obtusissima. Inflorescentia caulis non distincta, subpaniculiformis, in cymis ramosis. Pedicelli quam corollae tubus breviores. Flores magni. Calyx campanulatus, glaber, segmentis quam tubus longioribus, deltoideis, subacutis paulo longioribus quam latioribus. Corolla suburceolata, in parte inferiore leviter coarctata, glabra, segmentis quam tubus brevioribus, subovatis, obtusis et acuminatis paulo longioribus quam latioribus. Stamina supra corollae tubi medium inserta; antherae superiores corollae segmentorum basim paulo superantes. Carpella conniventia, ovato-lanceolata, in stylis quam carpella brevioribus, conniventibus, graciliusculis, attenuata. Squamae longe lineari-subdeltoideae, multo longiores quam latiores.

Le *Kalanchoe Rogersii* possède une tige érigée, assez robuste, glabre simple, haute de 1 m. 05.

Les feuilles, glabres et opposées, sont pétiolées; le pétiole, plus bref que le limbe, est assez large et un peu dilaté à la base; le limbe, un peu plus haut que large, oblong ou orbiculaire-oblong, très obtus au sommet, est pourvu, sur les bords, de crénelures peu nombreuses, larges et irrégulières; le pétiole est long de 22 à 24 mm.; le limbe est haut de 50 à 55 mm. et large de 36 à 42 mm.

L'inflorescence, qui termine la tige, est subpaniculiforme; elle est composée d'un petit nombre de pédoncules opposés et terminés à leur sommet par des cymes bipares ramifiées; elle est haute de 35 cm. et large de 28 cm.

Les pédicelles, glabres, sont grêles et assez longs; leur hauteur est de 3 à 5 mm.

Le calice, glabre, est composé d'un tube plus bref que les divisions et de quatre segments, appliqués contre la corolle, deltoïdes, un peu plus hauts que larges, à bords entiers, subaigus au sommet; la hauteur du tube calycinal est de 0.75 à 0.80 mm.; la longueur des segments du calice est de 1.60 à 2 mm. leur largeur, de 1.30 à 1.50 mm.

La corolle glabre, beaucoup plus longue que le calice, suburcéolée, légèrement rétrécie dans la partie supérieure, se compose d'un tube beaucoup plus long que les divisions, haut de 9 à 9.20 mm., et de quatre segments subovés, à bords entiers, obtus et assez brusquement acuminés au sommet; ces segments, plus hauts que larges, sont longs de 2.90 à 3 mm. et larges de 2.20 à 2.30 mm.

L'androcée se compose de huit étamines glabres, à filets longuement linéaires-subdeltoïdes. Le sommet des filets alternipétales, insérés au dessus du milieu du tube de la corolle, atteint presque la base des segments corollins; la partie soudée des filets alternipétales est haute de 7 à 7.20 mm.; leur partie libre est longue de 1.20 à 1.30 mm. et large de 0.12 mm. Le sommet des filets oppositipétales, insérés un peu plus haut que les filets alternipétales, dépasse très légèrement la base des segments corollins; la partie soudée des filets oppositipétales est haute de 8 à 8.10 mm.; leur partie libre est longue de 1.05 à 1.15 mm. et large de 0.20 mm. Les anthères réniformes-suborbiculaires, aussi hautes que larges, émarginées à la base et très obtuses au sommet, sont longues de 0.60 à 0.70 mm. et larges de 0.60 à 0.70 mm.

Les carpelles, soudés entre eux dans leur partie inférieure, sont appliqués les uns contre les autres; ils sont ovés-lancéolés au sommet en styles plus brefs qu'eux, grêles et terminés par des stigmates à peine dilatés; la partie soudée des carpelles est haute de 1.40 à 1.50 mm.; leur partie libre est longue de 5.60 à 5.75 mm.; les styles sont hauts de 2 à 2.10 mm. Dans chaque carpelle, les placentes sont réduits à deux grêles cordons subverticaux, presque parallèles à chacun des deux bords internes des carpelles, quoiqu'un peu incurvés en dedans dans leur partie inférieure; ces placentes portent, sur toute leur longueur, de très nombreux ovules.

Les écailles, longuement linéaires-subdeltoides, obtuses au sommet, plus hautes que larges, sont longues de 1.30 à 1.50 mm. et larges de 0.30 à 0.40 mm.

Cette plante a été récoltée le 14 juin, 1905, à Komati-Poort (Transvaal) par F. A. Rogers, qui l'a distribuée sous le no. 865.

Le *Kalanchoe*, *Rogersii* doit être inséré dans le treizième groupe proposé dans ma monographie du genre *Kalanchoe*. [Raymond Hamet, Monogr. du g. *Kalanchoe*, in Bull. Hb. Boissier, seconde série, t. VII, p. 879 (1907)].

The South African Species of the Genus *Cotyledon*.

By S. SCHÖNLAND.

In the year 1902, I published with Mr. E. G. Baker in the Journal of Botany, Vol. XL, notes on a number of South African species of *Cotyledon*. Most of the species described by the older authors were discussed after having been, as far as possible, compared with existing types. Those who have used this paper must have had the feeling that there were quite a number of species which were very ill defined, and a study of a large amount of material which has gone through my hands in the intervening years has shown me that many of them cannot be maintained. It seemed, therefore, desirable to state briefly what my present views are with reference to the species then known. Moreover, several well-defined species have since been published, and in this paper I add the descriptions of several more. I do not intend to repeat all the information embodied in the previous paper. My chief endeavour has been to group the known species as naturally as possible. In forming groups I have avoided coining new names; thus, I speak of the *Orbiculata* group because *C. orbiculata* is its mostly widely spread and best known member, whereas I could hardly have called them *Orbiculatae* since such forms as *C. decussata* with subterete leaves must be included. To each species I have added the most important literature and its geographical distribution. In some species, as e.g. *C. orbiculata* and *C. decussata*, it will appear to those not well acquainted with these plants that I "have brought vagueness and confusion into places where we had believed order to be established which may to some be disappointing, but it is best not to deceive ourselves any longer." I have borrowed these appropriate words from Mr. Bateson (See "Materials for the Study of Variation," 1894, p. 11) and would especially call attention

to the fact that many species of *Cotyledon* will probably form the finest material for the study of variation in plants that can be obtained; I only regret that circumstances have prevented me from making the best use of my opportunities in this direction. I must also mention the fact that hybridisation seems to occur pretty frequently in this genus. I have called attention to several suspected hybrids under *C. orbiculata*, *coruscans*, *decussata* and *teretifolia*.

From what I know of the anatomy of the genus it appears to me that sometimes where external morphological characters, especially in Herbarium specimens, fail to give satisfactory distinctions of allied species, anatomical characters are quite decisive. It is not my intention to deal here with this aspect, especially as my investigations are not complete yet. I will only mention one instance. I doubt whether *C. orbiculata* L. and *C. virescens* Schönl. et Bak. fil. can be distinguished by floral characters, and even the distinctions of the leaves, though apparent to the practised eye, are slight and disappear in the dried specimens. The general habit is common to both. There remains the naked-eye differences in the stem mentioned later on, and a section through the stem or its branches shows a very wide difference apart from the relative dimensions of the tissues. The xylem in *C. orbiculata* L. consists of a few groups of vessels, numerous tracheids, few woodfibres. Wood parenchyma is only represented by isolated scattered cells. On the other hand the xylem of *C. virescens* Schönl. et Bak. fil. is largely made up of thin walled parenchyma, a certain amount of collenchyma (!) and groups of vessels, whereas tracheids and woodfibres are absent. The occurrence of collenchyma in the xylem of *C. virescens* is very noteworthy and equally noteworthy is the fact that the phloem is also largely composed of it.

I am indebted for the loan of specimens to Mrs. F. Bolus, B.A., Curator of the Bolus Herbarium, the Director of the S. A. Museum, and Dr. Marloth. Mrs. Bolus also kindly supplied copies of descriptions published in periodicals which are not available in Grahamstown.

SEC. I. PANICULATAE. Inflorescence cymose. Flowers always conspicuously pedicelled, usually pendulous.

A. Leaves opposite.

Velutina group. Richly branched shrubs, 1-2 m. high, with large, flattened, broad leaves. Inflorescence richly branched. Flowers reddish. Filaments very much broadened at the base and without hairs.

Leaves somewhat stiff, glabrous or glabrescent, frequently semi-amplexicaul, calyx-lobes 5 mm. long, glabrous

1. *C. velutina* Hook. f.

Leaves flabby, tomentose, subpetiolate, calyx-lobes 7 mm. long, tomentose

2. *C. mollis* Schönl. n. sp.

1. *Col. velutina* Hook. f. in Bot. Mag. t. 6584. Cape Colony, most likely Eastern parts (exact locality not known).

Var. *Beckeri* Schönl. *Col. Beckeri* Schönl. et. Bak. f. in Journ. of Bot. XL (1902) p. 12.

Common in the bush near Port Alfred, rising to about 2200' near Grahamstown; also near Uitenhage (e.g. Z. 2566; Redhouse, Mrs. T. V. Paterson 421), and Graaff-Reinet, 2600-3500', Bolus 2352. Except that the variety *Beckeri* is always absolutely glabrous, I do not see any permanent difference from the type. *C. crassifolia* E. & Z. Enum. 1956 (1837) should be compared with this. I have not seen a type. E. & Z. found it in the bush near Uitenhage.

2. *Col. mollis* Schönl. n. sp.

Frutex ramosus cauli ramisque carnosus foliis decussatis, ramulis junioribus foliisque tomentosis. Folia obovata-cuneata inferne attenuata subpetiolata subplana aquosa tactu mollissima marginibus leviter undulatis apice obtusa vel submucronata. Pedunculus terminalis pubescens gracilis subnudus. Flores in paniculam laxam cymosam dispositi nutantes, majores. Calyx extus tomentosus tubo brevi lobis lanceolatis acutis. Corolla extus

tomentosa tubo subcylindrico bene evoluto lobis tubo subaequilongis ensiformibus patentibus. Stamina quam tubus corollae longiora filamentis inferne dilatatis pilis nullis, antheribus late ovatis basi cordatis. Carpidia gracilia corollae subaequilonga. Squamae subquadratae latiores quam longae.

Frutex circ. 1 m. altus. Folia circ. 8 cm. longa, 3-3.5 cm. lata. Pedunculus circ. 35 cm. longus. Tubus calycis circ. 2.5 mm. longus, lobi circ. 8 mm. longi. Tubus corollae circ. 1.5 cm. longus circ. 8 mm. latus, lobi circ. 1.7 cm. longi.

"In river bed, under shade of rocks, Junction Farm, Queens-town, 2500'. E. E. Galpin 8263, Nov. 1911."

A specimen collected amongst rocks near Komgha (Flanagan 1316) evidently belongs to this species, although the calyx lobes are somewhat shorter and broader than in the type and the flowers are not so hairy. It was referred to under *C. Beckeri* in Journ. of Bot. XL (1902), p. 13.

Shrubby, about 1 m. high (including peduncle which is about 35 cm. long). Stem branching, leafy at summit. Leaves very soft, flabby and watery, like the young branches densely covered with short shaggy hairs, obovate-cuneate subpetiolate with slightly undulating margin and obtuse or submucronate apex, circ. 8 cm. long and 3-3.5 cm. broad in the widest portion. Peduncle elongated, pubescent. Flowers in a loose cymose panicle, drooping. Calyx-tube very short, lobes about 8 mm. long, lanceolate acute, separated by roundish interspaces. Corolla yellow and reddish. Tube subcylindrical circ. 1.5 cm. long, circ. 8 mm. wide. Lobes ensiform, acute, circ. 1.7 cm. long. Stamens not far short of the length of the corolla, filaments without hairs at the base, where they join the corolla tube greatly broadened. Carpels about as long as the corolla. Squamae subquadrate much broader than long.

Described from a dried specimen with the aid of some notes supplied by Mr. Galpin. Easily distinguished from *Col. velutina* by its subpetiolate, flabby, not subamplexicaul leaves and much longer calyx-lobes, besides its hairiness is always more pronounced.

Ramosissima group. Much branched, glabrous shrubs, usually about 1 m. high with more or less woody stem and short rather thick flattish obovate-cuneate remote decussate leaves. Flowers reddish, either single or in pairs. Filaments glabrous.

3. *C. ramosissima* Salm Dyck.

3. *Col. ramosissima* Salm-Dyck, in Pl. Succ. Hort. Dyck, ex Haworth, Suppl. p. 25 (1819); Salm-Dyck, Hortus Dyckensis p. 80 (1834); DC. Prodr. 3, p. 396; Harvey in Fl. Cap. II, p. 372; Schönland et Bak. fil. in Journ. of Bot. XL (1902), p. 21.

District of George (ex Harvey); common in scrub in rocky dry localities near Uitenhage and north of Grahamstown.

Var. *Hoodii* Schönl. *Col. Hoodii* Schönl. et Bak. fil. in Journ. of Bot. XL (1902), p. 21.

Banks of the Nahoon river near East London and at Port Alfred. In this variety the flowers are always found singly, the calyx-lobes are broader and shorter than in the type and the leaves in the wild plants are narrower. The plant illustrated in Bot. Mag. t. 6417 seems to belong to this variety.

Orbiculata group. More or less branched mostly glabrous large leaved shrubs with robust, usually decumbent stem and ascending branches. Flowers reddish. Filaments not broadened at the base but with a tuft of hairs each.

1. Leaf blade expanded.

Leaves more or less farinose-pulverulent glaucous, more or less flat

4. *C. orbiculata* L.

Leaves decidedly green, distinctly concave on the upper surface

5. *C. virescens* Schönl. et Bak. f.

Leaves purplish brown passing into greenish white towards the base, margin waxy, undulating

6. *C. mucronata* Lam.

2. Leaves much longer than broad

Calyx-lobes longer than broad

7. *C. coruscans* Haw.

Leaves typically terete or subterete, calyx-lobes about as long as broad

8. *C. decussata* Sims.

This group contains the following species described in the Flora Capensis, 11, p. 371, 372 : *C. orbiculata* L., *C. coruscans* Haw., *C. purpurea* Thunb., *C. decussata* Sims.

Nobody seems to know at present what is meant by *C. purpurea* Th. and a fresh examination of the type seen by Harvey will be required to elucidate it. It is not likely to be different from some well known species. (See Journ. Bot. XL (1902) p. 18.) *C. orbiculata* L. has been split up into a number of species, but after having seen a great deal of material, both fresh and dried, I have failed to divide it even into well defined varieties. This is all the more puzzling owing to the fact that according to experiments made by Sir Arnold Theiler at the suggestion of Mr. Burt-Davy, this species is poisonous in the Transvaal (it kills fowls if fed on it) while plants from Cape Colony, as far as experimented with, are innocuous.

In this protean species, general habit, shape and size of leaves, waxy covering of leaves, shape and length of calyx-lobes, absolute and relative lengths of corolla tube and corolla lobes, etc., are all so variable that many of the older species can safely be included in it. I have not united with it *C. coruscans* Haw., which is also very variable. Though the extreme forms can be easily distinguished, it is connected by intermediate forms with *C. orbiculata*. I have also retained *Col. mucronata*, which when wild is quite distinct, but loses its distinctions under cultivation. *Col. virescens* Schönl. et Bak. fil. (Journ. of Bot. XL (1902) p. 14) seems to be always distinct.

When we come to *Col. decussata* Sims, we must first take into account the fact that the leaves may be semi-terete or even channelled on the upper surface; no doubt a broadening of the blade may also take place if we judge by what happens in the form which I distinguished as *Col. Flanaganii*. Moreover, here the leaves are not always entire. Thus we must give up *C. Galpini* and *C. tricuspidata* Haw. as separate species, as will be shown later on. How far natural hybridisation in this group is responsible for the diversity of forms remains yet to be investigated.

4. *Cot. orbiculata* L. sp. pl. 429 (1753); Harvey in Fl. Cap. 11, p. 371; Schönland and Baker fil. in Journ. of Bot. XL (1902) p. 11; DC. Prodr. 111, p. 396, Pl. Gr. t. 76; Bot. Mag. t. 321; Haworth Revis. p. 105.

I have already mentioned that I cannot characterise the varieties of this species, attempts to form them having been made by De Candolle in Prodr. 111 (1828) p. 396, Salm-Dyck in Hortus Dyckensis (1834) p. 80, and others.

The following seem to be undoubtedly synonyms :

C. ambigua Salisb. Prodr., p. 307 (1796),

C. ovata Haw. Rev., p. 105,

C. oblonga Haw. Rev., p. 106,

C. elata Haw. Suppl., p. 20,

C. ramosa Haw. Suppl., p. 20,

C. ramosissima Mill. dict. ed. 6 (1768),

C. coruscans E. & Z. (non Haw?).

I also include

C. crassifolia Haw. in Phil. Mag. (1827); Journ. of Bot. XL (1902) t. 432.

C. undulata Haw. Suppl. 20 (1819); Journ. of Bot. XL (1902) t. 431.

Found in the coast districts of South Africa from Northern Damaraland to Natal, and extending to the Transvaal, (Pretoria, etc.)

There is a puzzling specimen in the Bolus Herbarium collected by Dr. J. M. Wood (no. 11044) on the Berea near Durban. It has an inflorescence and flowers which would place it under or near *C. orbiculata* L. but the leaves approach very closely those of *C. mollis* Schönl. both in shape and hairiness. Pending further enquiry I am inclined to place this specimen amongst the suspected hybrids.

5. *Cot. virescens* Schönl. et Bak. fil. in Journ. of Bot. XL (1902) p. 14. ? *C. viridis* Haw. in Phil. Mag. 1827, p. 273.

In the Bush near Port Alfred reaching the neighbourhood of Grahamstown; Kentani, alt. 20', Miss Pegler 1347. To this be-

longs most likely also Galpin 2144 from "valley at base of Intabu Magwele mountain, Queenstown, alt. 4000'."

The branches of this species are much more fleshy than in *C. orbiculata* L., their cortex occupying nearly half the radius. They are also thicker. Further, the internodes in *C. orbiculata* lengthen after the leaves have dropped, whereas here they retain approximately their original length and the branches become subannulate. The thick branches and short internodes serve generally to distinguish this species even in dried specimens.

6. *Col. mucronata* Lam. dict. 142 (1786).

Burm. Dec. t. 19, fig. 2; Schönl. et Bak. fil. in Journ. of Bot. XL (1902) p. 15.

Graaff-Reinet and other parts of the Eastern Karroo.

7. *Col. coruscans* Haw. Suppl. 28 (1819); Bot. Mag. t. 2601; Lodd, Bot. Cab. 1030; Harvey in Fl. Cap. 11, p. 371; Schönland and Bak. fil., Journ. of Bot. XL (1902), p. 17.

C. canalifolia Haw. in Phil. Mag. (1825), p. 23; Journ. of Bot. XL (1902), t. 433.

C. Whitei Schönl. and Bak. fil. in Journ. of Bot. XL (1902), p. 19.

Mr. Baker and myself pointed out that there seem to be more than one species treated by Harvey in the Flora Capensis under this name, but it is possible they may have ultimately all to be united with *C. orbiculata*. If we take the plant figured in the Bot. Mag. t. 2601, as the type, then we have *C. coruscans* from Port Elizabeth and from the neighbourhood of Grahamstown, the plant described by us as *C. Whitei* being sometimes indistinguishable from the plate cited, while other specimens shade into *C. orbiculata*. Typical specimens were collected by MacOwan (819) on the Grahamstown flats and at Bruintjeshoogte, and I have also had it from Oudtshoorn. I believe that the forms intermediate between *C. coruscans* and *orbiculata* are natural hybrids, but I have no decisive evidence to offer on this point which will repay careful investigations.

8. *Col. decussata* Sims Bot. Mag. t. 2518 (1824); Lindl. Bot. Reg. t. 915; Harvey in Fl. Cap. 11, p. 372; Schönland and Bak. fil. in Journ. of Bot. XL (1902), p. 19.

? *C. purpurea* Thunb. Fl. Cap. 326.

C. tricuspidata Haw. in Phil. Mag., p. 32 (1825); Schönland et Bak. fil. Journ. in Bot. XL (1902), t. 434.

C. papillaris L. ? *tricuspidata* Salm-Dyck in DC. Prodr. 111, p. 397.

C. spuria L. sp. pl. ed. 11, p. 614 (1762); Burm. Prodr. Fl. Cap. 1, 13 (1768); Burm. Dec. t. 22, fig. 1. (If the reference to this figure is correct, then Linnaeus' name must be adopted for the species.)

C. unguolata Lam. Dict. 11, p. 139 (1786).

Harvey in Fl. Cap. 11, p. 377, says that this appears to be the same as *C. coruscans*. This cannot be correct as Lamarek quotes Burm. t. 22, 1. On the other hand *C. unguolata* as figured in DC. Pl. Gr. t. 168, may be *C. coruscans*.

? *C. canaliculata* Haw. Suppl. 22 (1819).

C. Flanaganii Schönl. et Bak. f. in Journ. of Bot. XL (1902) 22.

? *C. Galpini* Schönl. et Bak. fil. l.c. p. 16.

This species is fairly common in the drier parts of Western Cape Colony. I have also had the typical form from Norval's Pont, and it is found at Blue Cliffs in the Uitenhage division (E. West 348 in Herb. Bolus). In view of the great variability of this species under cultivation I have come to the conclusion that *C. Flanaganii* cannot be kept up, and perhaps *C. Galpini* has also to be discarded, which would give the plant a more extended Eastern distribution. In the case of *C. Galpini* I suspect hybridisation with *C. orbiculata*. The flowers are so similar to those of *C. orbiculata* L. that it is almost impossible to give tangible differences between them, and in the dried state especially I would be incapable of distinguishing them. Moreover, they vary both in absolute and relative lengths of their parts.

I felt sure that the plant described as *C. Flanaganii* Schönl. et Bak. fil. was quite distinct. Its long leaves are gradually narrowed at the apex whereas in typical *C. decussata* they are shorter,

thicker and they end abruptly, but this and other small differences are not constant, and thus *C. Flanaganii* cannot be kept up, and *C. decussata* thus extends from Namaqualand through the Karroo to the neighbourhood of Queenstown and the Kei River. It is also found near Alicedale, and as previously stated in the Uitenhage district.

A couple of years ago I received from Mr. E. E. Galpin specimens collected at Lesseyton, distr. Queenstown, which had extraordinarily polymorphic leaves. On the same specimen might be seen nearly terete leaves typical of *C. decussata*, others flat on the upper surface, strongly convex on the lower, others nearly flat on both sides, in outline obovate-cuneate, approaching the type of *C. Galpinii*. But in addition to these flat, quite entire leaves, there were others in which the margin was strongly undulate, in others they were coarsely (and usually asymmetrically) toothed, the teeth being usually blunt, but in one case quite acute. Amongst them were leaves which could almost be matched with *C. tricuspidata* Haw. It is of interest to note that Haworth states "that, after flowering, the leaves become almost all entire," and the same thing happened in the plants from Mr. Galpin, which I had an opportunity of observing after planting them. I may add that I have observed an occasional flattening of the leaves also in specimens received from Victoria West. Whether these peculiarities are the result of natural hybridisation, as seems likely, can only be decided by careful experiments.

Pillansi group. Suffructicose mostly robust plants resembling the ORBICULATA group in habit. Lobes of corolla usually longer than the tube. Flowers (and frequently other parts) glandular-pubescent. Filaments with a tuft of hairs above the base where they join the corolla.

Leaves flattish, broadened

Leaves glabrous. Corolla-tube ventricose but not decidedly swollen at the base, about 1 cm. long. Lobes about 1.7 cm. long

9. *C. Deasii* Schönl. n. sp.

Leaves glabrous. Corolla-tube decidedly swollen at the base, subcylindrical in the upper portion, about 1.5 cm. long, lobes a trifle longer 10. *C. Wickensii* Schönl. n. sp.

Leaves hispid or subglabrous. Corolla-tube subglobular or subcylindrical, about 6 mm. long, lobes usually about 11 mm. long 11. *C. Pillansi* Schönl.

Leaves terete or subterete 12. *C. teretifolia* Thunb.

9. *Col. Deasii* Schönl. n. sp.

Fruticulus. Caulis decumbens robustus basi valde ramosus ramis inferne cicatricibus foliorum delapsorum notatis superne foliosis. Folia decussata glabra glauca obovato-cuneata vel oblanceolato-cuneata subamplexicaulia crassa subplana vel dorso rotundata apice acuta vel submucronata. Pendunculus terminalis gracilis nudus vel subnudus superne pubescens. Flores in paniculam laxam multifloram corymbosam dispositi pedicellis gracilibus nutantibus. Calyx extus viscoso-pubescens tubo lutescenti paulum ventricosus 5-sulcato lobis rubeolis tubo longioribus patentibus. Filamenta gracillima tubo corollae basi adnata et pilis longis congestis ornatis, antheris oblongis. Carpidia gracilia staminibus subaequilonga, stigmatibus parvis capitatis. Squamae late ob-cuneatae apice truncatae et leviter emarginatae.

Folia 6-7 cm. longa 1.5-2.5 cm. lata. Pedunculus circ. 30 cm. longus. Calyx circ. 6 mm. longus. Tubus corollae circ. 1 cm. longus, lobi circ. 1.7 cm. longi. Stamina circ. 1.2 cm. longa, antherae circ. 4 mm. longae.

"Oudtshoorn district." Mr. W. Deas 13, Nov. 1914.

A shrub richly branched from the base with ascending branches which bear at their top a few pairs of decussate, glabrous, glaucous obovate-cuneate or oblanceolate-cuneate subamplexicaul, acute or submucronate, fleshy, almost flat or dorsally rotund leaves which are 6-7 cm. long and 1.5-2.5 cm. broad in the broadest portion. The inflorescence is pedunculate and terminal. The peduncle is about 30 cm. long and bears a laxly branched multi-flowered cymose panicle. The upper portion of the peduncle is slightly

hairy, the branches of the cyme and pedicels are distinctly viscid-pubescent. The calyx is about 6 mm. long, viscid-pubescent on the outside and has a very short tube and triangular acute lobes with acute interspaces. Corolla slightly viscid pubescent on the outside, tube slightly ventricose, 5-sulcate, about 1 cm. long, reddish on back except on one side which is whitish. Stamens attached to the base of the corolla-tube and with a tuft of hairs where they become free. Filaments very slender, outer and inner about equal, about 1.2 cm. long. Anthers yellowish white, about 4 mm. long. Carpels eventually as long as the stamens and with a very small capitate stigma. Squamae broadly cuneate, truncate and slightly emarginate at the top.

In Herb. Bolus there is a specimen (10761) which was grown in Mr. N. S. Pillans' garden at Rosebank near Capetown. It must be referred to this species but has smaller flowers than the type, the tube of the corolla being only 6 mm. long. All other parts are proportionally smaller, only the calyx lobes are also relatively smaller and broader.

10. *Cot. Wickenii* Schönl. n. sp.

Fruticulus. Caulis crassus adscendens glaber ē basi efoliato ramosus. Folia decussata subrosularia glabra oblongo-ovata acuta basi attenuata interdum medio carinata glauca carnosae turgidae. Inflorescentia terminalis, pedunculo elongato terminali subtereti glabro subnudo, cyma multiflora ramosissima subdensa ramis pedicellisque glanduloso-pubescentibus. Calyx extus glanduloso-pubescentibus tubo brevi lobis ovatis acutis. Corolla ruber extus glanduloso-pubescentibus tubo inferne ventricoso 5-sulcata superne subcylindrico lobis sublanceolatis subobtusis recurvis tubo paulum longioribus. Filamenta basi hirsuta antheris oblongis. Squamae ligulatae apice excavatae subtubulatae marginibus irregularibus.

Folia circ. 10 cm. longa, 4-6 cm. lata. Pedunculus circ. 30 cm. longus. Pedicelli circ. 2 cm. longi. Tubus calycis circ. 2 mm. longus, lobi, circ. 7 mm. longi. Tubus corollae circ. 1.5 cm. longus. Filamenta circ. 2.2 cm. longa, antherae 5 mm. longae. Squamae 2.5 mm. longae.

"On stony kopjes at Smit's Drift, Pietersburg, N. Transvaal." Collected by Mr. Wickens, Government gardener, Union Buildings, Pretoria and Mr. I. B. Pole-Evans. In flower, June, July, 1914. Communicated by Mr. I. B. Pole-Evans, M.A.

Suffruticose; stem robust, ascending, glabrous, branching from the efoliate base. Leaves decussate, sub-rosulate, oblong-ovate, acute, attenuate at the base (sub-petiolate), glaucous, fleshy, rather soft, about 10 cm. long, 4-6 cm. broad in the middle, sometimes asymmetrical, sometimes with a distinct median carina. Peduncle stout, subterete, about 30 cm. long, glabrous, provided with 1 or 2 pairs of deciduous, reduced leaves. Inflorescence much branched, rather dense; branches glandular hairy, pedicels about 2 cm. long, frequently more or less curved. Calyx on the outside glandular pubescent, tube short, about 2 mm. long, lobes ovate, acute, about 7 mm. long. Corolla red, glandular pubescent on the outside, considerably swollen at the base, and with five ridges which protrude between the calyx lobes, variable in length; tube about 1.5 cm. long, lobes a trifle longer, sublanccolate, subobtuse. Stamens with slender filaments, hairy near the base, the free portions about 2.2 cm. long, pale yellow towards the base, reddish above; anthers oblong, yellowish, 5 mm. long; carpels slender; scales strap-shaped, 2.5 mm. long, tubular at the top, upper margin with irregular outline.

11. *Col. Pillansii* Schönl. in Rec. Alb. Mus. 11, p. 152 (1907).

C. cuneata Harv. in Fl. Cap 11, p. 373 (non Thunb.).

From Namaqualand through the Western Karroo to Biesjespoort; Oudtshoorn.

The corolla-tube is often subglobular, but may be more or less elongated, the calyx-lobes also vary slightly in shape and may be nearly lanceolate.

Specimens collected on the Percy Sladen Memorial Expedition, 1908-1909, between Middlekraal and Brakdam (Pillans 5592) have larger flowers than the type of *C. Pillansii* and longer corolla-tube as compared with the lobes. I have referred it to this species in Ann. S. A. Mus. IX, p. 54 (1912), as otherwise it does not differ from it.

12. *Cot. teretifolia* Thunb. Prodr. p. 83 (1797). Fl. Cap. ed. Schultes, p. 397; DC. Prodr. 111, p. 397; Harvey in Fl. Cap. 11, p. 373; Bot. Mag. t. 6235.

C. campanulata Marl. in Trans. S. A. Phil. Soc. XVIII, p. 46, t. V, fig. 6.

A common plant in the eastern Karroo (Graaff Reinet, neighbourhood of Uitenhage, etc., extending to the carroid parts north of Grahamstown).

Varies considerably in the hairiness of the leaves and other parts, but it is hardly possible to keep up the variety *subglaber* Harv., as the same plant may appear different in this respect according to the season. I have examined Marloth's plant, both alive and dried, and cannot separate it from *teretifolia*.

A plant preserved in the Bolus Herbarium (12928) collected by B. Rogers at Middleton near Somerset East in 1907 is accompanied by the following remarks in Mrs. F. Bolus' handwriting: "This was sent living with specimens of *C. papillaris* and *C. teretifolia* and seemed to partake of the characters of both. The leaves were smaller than those of *C. teretifolia* but the same shape exactly and pubescent. The corolla was the same colour as that of *C. papillaris* and the general habit was the same as that species. ? hybrid between the 2 species."

I quite think that this is most likely a natural hybrid. Another plant in the Bolus Herbarium collected by MacOwan near Somerset East in 1873 is also probably a hybrid. It combines to a certain extent the characters of *C. teretifolia* and *C. coruscans*. MacOwan remarked that this "is a variety of *C. teretifolia* with green flowers, leaves almost flat, resembling in barren specimens those of *C. coruscans* Haw." The leaves are coarsely pubescent. The inflorescence and flowers are close to those of *C. coruscans*.

Gracilis group. Small halfshrubs with comparatively thin stem and branches. Inflorescence few-flowered, generally with long slender peduncle.

Calyx and corolla on the outside more or less glandular-pubescent

Corolla-tube about equalling the lobes in length

13. *C. papillaris* L. f.

Corolla-tube much shorter than the lobes

14. *C. gracilis* Harv.

Calyx and corolla glabrous

Leaves oblong-linear

15. *C. Muirii* Schönl. n. sp.

Leaves obovate-cuneate

16. *C. Meyeri* Harv.

13. *Cot. papillaris* L. f. suppl. p. 242 (1781); Thunberg, Prodr. p. 83 (1797); Harvey in Fl. Cap. 11, p. 372.

C. glutinosa Schönl. in Rec. Alb. Mus. 1, p. 119.

Widely distributed in the Western Karroo, extending to Oudtshoorn and Namaqualand.

C. cuneata Thunb. in Fl. Cap. ed. Schultes (1823), p. 395, may be allied to *C. papillaris*. However, the description is too short for identification. I have doubtfully referred to it a plant collected by Schlechter (11443) at Vuurdoord, Western Region, in which the leaves are absent. A short description was given in Journ. of Bot. XL (1902), p. 89, where I expressed the opinion that it might be *C. tomentosa* Harv.

14. *Cot. gracilis* Harv. in Fl. Cap. 11, p. 373 (most likely not identical with *Cot. gracilis* Haw. Suppl. (1819), p. 26, of which no type seems to be preserved)—*C. papillaris* L. f. var. *robusta* Schönl. et. Bak. fil. in Journ. of Bot. XL (1902) p. 32.

Widely distributed in the Eastern Karroo extending to the neighbourhood of Grahamstown and into the Tarka district.

15. *Cot. Muirii* Schönl. n. sp.

Fruticulus. Caulis gracilis e basi valde ramosus ramis adscendentibus lignosis radicanibus teretibus basi cefoliatis, junioribus sparse glanduloso-tomentosis. Folia leviter incurva, juniora subglabra basin versus pubescentia, glauca, apice linea angusta rubra cincta oblongo-linearia basi cuneata carnosae subsemiteretia. Pedunculus terminalis gracillimus teres farinosus nudus. Cyma

terminalis laxa pauciflora pedicellis gracilibus floribus nutantibus. Calyx farinoso-pulverulentus tubo brevi lobis deltoideis acutis. Tubus corollae pentagonalis lobis lanceolatis subaequilongus. Filamenta basi hirta. Antherae oblongo-ovatae. Squamae subquadratae apice rotundatae et emarginatae.

Rami circ. 5 mm. diam., circ. 8 cm. longi, internodiis inferioribus circ. 1 cm. longis superiora gradatim breviora. Folia 3-3.5 cm. longa, circ. 7 mm. lata. Pedunculus 12-14 cm. longus basi circ. 3 mm. diam. Pedicelli 1-1.5 cm. longi. Tubus calycis circ. 1 mm. longus, lobi circ. 1.5 mm. longi. Tubus corollae circ. 1 cm. longus, circ. 7 mm. latus. Filamenta circ. 12 mm. longa.

"Middledrift (Karoo near Albertinia), in the kloof amongst rocks." Dr. J. Muir 786, Sept. 1914.

Stem slender, richly branched from the base. Lower parts creeping and *rooting*, woody, evidently to a certain extent underground, and thus forming a branched rhizome about 4 mm. in diam. Branches ascending, about 5 mm. in diam., terete, in the younger portions sparingly glandular-tomentose, efoliate in the lower portions, about 8 cm. long (without the terminal peduncle), lower internodes about 1 cm. long, upper gradually smaller. Leaves slightly incurved, younger subglabrous, slightly hairy towards the base, or quite glabrous; older usually quite glabrous, glaucous, with a narrow reddish border at the apex, usually slightly oblique, oblong-linear, slightly attenuated at the base and therefore subpetiolate, acute at the apex, or subcuspidate, very fleshy, with upper surface almost flat, lower slightly convex, 3-3.5 cm. long, 7 mm. broad. Peduncle terminal, very slender, terete, glabrous, slightly curved, 12-14 cm. long, about 3 mm. thick at the base, gradually getting a little narrower, for the most part dark reddish, farinose, especially in upper parts. Inflorescence terminal, lax, cymose, few-flowered; bracts absent, flowers nodding, pedicels slender, 1-1.5 cm. long. Calyx farinose-pulverulent, tube about 1 mm. long, teeth deltoid, acute, with large rounded interspaces, about 1.5 mm. long. Corolla red (with slight farinose pulverulence) for the most part, lightish green in parts, tube pentagonal, about 1 cm. long, about 7 mm. wide, lanceolate limbs

about 1 cm. long. Stamens with tufts of hairs where they join the petals, filaments very light green, epipetalous ones about 12 mm. long, the others slightly longer, anthers oblong-ovate, pale yellow. Carpels slender. Squamæ subquadrate, at the apex rounded and emarginate, laterally only slightly united with carpels.

16. *Cot. Meyeri* Harv. in Fl. Cap. II, p. 372, described from a solitary and rather imperfect specimen collected by Drege in the Albert district, though stated to be glabrous is probably to be referred to *Cot. gracilis* Harv.

Tomentosa group. Branched half shrubs with tomentose thick ovate-oblong leaves. Corolla pubescent.

Leaves 5-6 cm. long. Tube of corolla three times the length of the calyx

17. *C. heterophylla* Schönl.

Leaves about 2.4 cm. long. Tube of corolla twice the length of the calyx

18. *C. tomentosa* Harv.

17. *Cot. heterophylla* Schönl. in Rec. Alb. Mus. 11, p. 150 (1907).

Along the road between Ladysmith and Laingsberg, E. Pillans (N. S. Pillans 968).

18. *Cot. tomentosa* Harv. in Fl. Cap. 11, p. 373.

Grootriver and Trompeterpoort, Uitenhage, Zeyher (ex Harvey).

This species is unknown to me. It appears to be a much more slender plant than the preceding species.

B. Leaves scattered and tufted.

Grandiflora group. Shrubs. Stem thick, fleshy, sparingly branched. Leaves scattered, dropping while the flowers are developing. Corolla elongated. Flowers upright.

Calyx lobes 1-1.5 cm. long, corolla-tube about 4 cm. long (usually distinctly curved)

19. *C. grandiflora* Burm.

Calyx lobes 5-8 mm. long, corolla-tube about 2 cm. long.

20. *C. cacalioides* L.f.

19. *Cot. grandiflora* Burm. Prodr. Fl. Cap. p. 13 (1768); Schönbl. et Bak fil. in Journ. of Bot. XL (1902) p. 23; *C. tuberculosa* Lam. Dict. 11, p. 139 (1786); DC. Pl. Gr. t. 86; DC. Prodr. 111, p. 397; Harvey in Fl. Cap. 11, p. 375; *C. curviflora* Sims Bot. Mag. t. 2044 (1819); Burm. Dec. t. 20 fig. 1; Comm. Pl. Rar. t. 23; *C. purpurea* Haw. suppl. pl. succ. p. 23 (1819).
 ? *interjecta* Haw. in Phil. Mag. (1828) p. 185; Schönbl. et Bak. fil. in Journ. of Bot. XL (1902) p. 20.

On Table Mountain, Camps Bay and near Simonstown. Harvey also quotes a specimen collected by Zeyher from the Buffeljagdsriver (Swellendam distr.) and another collected by Drege between the Little and Great Fish Rivers. I suspect that the last locality is a mistake.

20. *Cot. cacalioides* L.f. suppl. p. 242 (1781); Thunb. Fl. Cap. ed. Schultes p. 397; DC. Prodr. 111, p. 397; Harvey in Fl. Cap. 11, p. 374.

I have only seen this species from the Oudtshoorn division.

My specimens agree well with Harvey's description in the Flora Capensis. He states that the specimen on which he based his description agrees with the specimen in Herb. Thunberg who quotes Burm. Dec. t. 20 fig. 2, which, if it represents this species, is a very poor figure.

Paniculata group. Arborescent or small shrubs. Stem thick, fleshy, sparingly branched. Leaves dropping while the inflorescence is developing. Corolla more or less campanulate. Flowers nodding or pendulous.

Panicle glabrous.

Corolla 1.8-2.4 cm. long

Corolla 1-1.2 cm. long

Panicle and flowers viscous-pubescent

21. *C. paniculata* L. f.

22. *C. Eckloniana* Harv.

23. *C. Wallichii* Harv.

21. *Cot. paniculata* L. f. suppl. p. 242 (1781); Thunberg in Fl. Cap., ed. Schultes, p. 396; Burman Dec. t. 18 (1738).

C. spuria L. (p.p.). Willdenow in Sp. Pl. 11 (1799) p. 754 quotes Burman Dec. t. 19, fig. 1, which certainly represents a different species.

C. fascicularis Ait. Hort. Kew. 11, p. 106 (1789).

C. tardiflorum Bonpl. nav. t. 37.

A common plant in the Western Karroo, e.g. the Hex River Valley, extending to Bushmanland and Namaqualand. The leaves of young plants are pubescent.

22. *Col. Eckloniana* Harv. in Fl. Cap. 11, p. 374.
Namaqualand.

23. *Col. Wallichii* Harv. in Fl. Cap. 11, p. 374; Schönland in Rec. Alb. Mus. 11, p. 152.

Widely distributed in the Karroo. Harvey records it from the Elandsberg and the Snowy Mts. (Sneeuwberge?).

Reticulata group. Low shrublets with fleshy thick stem, dropping their leaves before flowering, the peduncle and its branches becoming hard and spiny. Flowers suberect.

Peduncles richly branched. Corolla about 1 cm. long.

24. *C. reticulata* Thunb.

Peduncles unbranched in lower portion. Corolla about 1.7 cm. long.

25. *C. Pearsoni* Schönl.

24. *Col. reticulata* Thunb. Prodr. 1, p. 83 (1794); Thunb. Fl. Cap., ed. Schultes, p. 393; DC. Prodr. p. 398; Harvey in Fl. Cap. 11, p. 376.

? *C. dichotoma* Haw. suppl. p. 27 (1819).

C. parvula Burch. Travels 1, p. 219 (1822).

Western Karroo and Little Namaqualand.

25. *Col. Pearsoni* Schönl. in Ann. S. A. Mus. IX, p. 55 (1912).
Little Namaqualand.

Ventricosa group. Low shrublets with fleshy thick stem. Leaves (which are usually shed at time of flowering) more or less linear. Flowers suberect. Corolla-tube more or less ventricose.

Leaves covering the branches, peduncle short, few-flowered, with a few membranous subulate empty bracts. Flowers glabrous.

26. *C. racemosa* E. Mey.

Leaves crowded at the apex of the stem, peduncle sparsely set with depauperated leaves, loosely branched. Flowers viscous pubescent.

27. *C. ventricosa* Burm.

26. *Cot. racemosa* E. Mey. in Fl. Cap. 11, p. 375.

Namaqualand. Not known to me.

I append some notes on this species published by Mr. N. E. Brown in Gard. Chron. LI (May 1912) p. 348.

"This rare plant is now flowering in the Royal Botanic Gardens, Kew, probably for the first time in Europe. It was discovered by Drège about 80 years ago in Little Namaqualand, in the vicinity of the Orange River, and appears to have been only twice collected since, once near Oograbis by Dr. Bolus (No. 9,546), and during the Percy Sladen Expedition to the Orange River in 1910 by Prof. Pearson, No. 6196, who sent the plant, which is now in flower, to Kew. The whole plant is 8 inches high, with a stout succulent stem, bearing short branches thickly clothed with linear-lanceolate, fleshy leaves and terminating in a short raceme or panicle of erect white flowers.

As this species is very inaccurately described in the *Flora Capensis*, the following account from the living plant will be useful to future monographers:—Plant 6 to 8 inches high. Main stem $\frac{3}{4}$ inch thick, erect, branching at the upper part, glabrous, with a thin sub-membranous, greenish-brown bark, peeling off like skin; leafless. Branches 1–1½ inches long, densely leafy, perhaps deciduous after flowering, glabrous, green. Leaves crowded, alternate spreading, directed all ways, softly fleshy and flexible, $\frac{3}{4}$ –2 inches long, 2½–5 lines broad, 1½ line thick, linear lanceolate or narrowly oblanceolate, acute and often recurved at the apex, tapering to a sessile base (not sheathing, as described) channelled down the face, thinly pubescent with very fine, short, spreading hairs, light green, not at all glaucous. Peduncles terminal, solitary on each branch, 1½–2 inches long, erect, racemose.

racemose-paniculate or rarely corymbose, paniculate at the upper half and with one or two very reduced leaves $2\frac{1}{2}$ –6 lines long on the lower half, glabrous throughout or thinly and inconspicuously pubescent on the lower part, tinted with dull purplish-brown. Bracts $1\frac{1}{2}$ – $4\frac{1}{2}$ lines long, linear-lanceolate, acute, resembling reduced leaves, or the smaller subulately tapering from a broad base, fleshy, becoming membranous when dried. Flowers erect. Pedicels 2–5 lines long, glabrous. Sepals 5, erect, 4 lines long, about equalling the corolla tube, lanceolate-attenuate, very acute, glabrous, light green. Corolla 5 lobed; tube 4 lines long, $2\frac{1}{2}$ lines, in diameter, pale green; lobes nearly 3 lines long, $2\frac{1}{2}$ lines broad, broadly ovate acute recurved spreading, white. Stamens 10, included at first, all collected round the styles, finally moving away and pressed close against the inside of the corolla tube; pollen yellow."

27. *Col. ventricosa* Burm. Prodr. p. 13 (1768); Burm. Dec. t. 21, fig. 1; DC. Prodr. 111, p. 397; Harvey in Fl. Cap. 11, p. 376; Schönland and Bak. fil. in Journ. of Bot. XL (1902) p. 90; Schönland in Rec. Alb. Mus. 11 (1907) p. 151.

Widely distributed in the Karroo.

var. *alpina* Harv. in Fl. Cap. 11, p. 376.

Found on the Elandsberg (Uitenhage distr.)—A specimen from Garies, Namaqualand, in Herb. Marloth (5461) referred to this variety, appears to be quite distinct and is probably an undescribed species. The material preserved is too poor for description.

Caryophyllacea group. Small subshrubs with thick fleshy stem and crowded leaves at the end of the branches with very loose cymose inflorescences. Corolla-tube subcylindrical (flowers resembling those of Sect. SPICATAE).

Flowers more or less erect, corolla-tube greenish with a purple limb.

- | | |
|--|------------------------------------|
| Corolla-lobes ovate acute | 28. <i>C. caryophyllacea</i> Burm. |
| Corolla-lobes equilaterally triangular | 29. <i>C. humilis</i> Marl. |
| Flowers pendulous, corolla orange | 30. <i>C. Phillipsiae</i> Marl. |

28. *Col. caryophyllacea* Burm. Prodr. Fl. Cap. p. 13 (1768). Dec. t. 17; *C. jasminiflora* Salm-Dyck; Schönl. and Bak. fil. in Journ. of Bot. XL (1902) p. 93.

Tandjesberg near Graaff-Reinet, Bolus 758. To this species a specimen collected by Marloth (3465), in sandy places near Riversdale, alt. 100 m., seems also to belong.

29. *Col. humilis* Marl. Ms.

C. nana Marl. (non N. E. Br.) in Trans. Roy. Soc. S. Afr. II (1910), p. 33.

Nieuwveld Mts. near Beaufort West.

Marloth mentions that it comes near the description of *Col. parvula* Burch. Cat. Geogr. 1218, Travels I, p. 219 (1822) which appears to have been collected on the Bokkeveld, on the way to Hangklip. This species has, however, been referred to *C. reticulata*.

30. *Col. Phillipsiae* Marl. in Trans. S.A. Phil. Soc. XVIII (1909), p. 46, t. V, fig. 3.

"Fairly common on the southern edge of the Roggeveld."

SEC. II. SPICATAE. Small halfshrubs with more or less fleshy, frequently very short stem (elongating in cultivation). Leaves often subrosulate. Main inflorescence racemose (spicate or subspicate), frequently with 2-3 flowered lateral cymes. Flowers more or less upright, with sub-cylindrical corolla-tube and short lobes.

A very natural section connected, however, with the Sect. PANICULATAE by the CARYOPHYLLACEA group.

Hemisphaerica group. Leaves and stem glabrous.

Flowers procurved

38. *C. procurva* N. E. Br.

Flowers straight, distinctly pedicelled, pedicels 4-6 mm. long. Leaves moderately thick, flattening out in the upper portion and with fairly sharp edges, frequently spotted

35. *C. trigyna* Burch.

Flowers straight, sessile or subsessile, sometimes the lower ones with distinct short pedicels

Corolla lobes deltoid acute carinate. Leaves obovate cuneate

C. Bolusii Schönl.

Corolla lobes not carinate

Corolla lobes ovate acute or acuminate, gently or, in some species, abruptly reflexed

Leaves very thick semi-globose or obovate, very convex on the back, sometimes also more or less convex on the adaxial surface

31. *C. hemisphaerica* Haw.

Leaves thick, fusiform, unspotted

32. *C. mamillaris* L. f.

Leaves semifusiform, canaliculate, spotted

33. *C. Marianae* Marl.

Leaves very thick of variable shape (terete with spathulate apex, obcuneate, elongate fusiform-falcate etc.) with smooth or crisped horny apex, usually spotted, always finely waxy-punctate

34. *C. Cooperi* Bak.

Corolla lobes ovate lanceolate subobtus, gently reflexed. Leaves obovate-spathulate, slightly convex on the back, less so on the adaxial surface, usually unspotted and often with a uniform thin waxy covering

37. *C. rhombifolia* Haw.

Cristata group. Leaves more or less obcuneate, usually crisped at the top, pubescent. Corolla lobes broadly ovate, acute or acuminate

Stem with rigid curled hairs, corolla glabrous

39. *C. cristata* Haw.

Stem and corolla pubescent

40. *C. Zeyheri* Harv.

31. *Cot. hemisphaerica* L. sp. pl., p. 614; Linn. Hort. Elth. t. 95, fig. 111; DC. Pl. Gr. t. 87; Harvey in Fl. Cap. 11, p. 376.

C. triflora Thunb. Prod. Fl. Cap. p. 83 (1784), Fl. Cap. ed. Schultes, p. 396; Haworth, Rev. Pl. Succ., p. 19; Salm-Dyck, Observ. (1820), p. 6; Schönland and Bak. fil. in Journ. of Bot. XL (1902), p. 91.

C. crassifolia Salisb. Prod., p. 307.

C. rotundifolia Haw. in Phil. Mag. 1827, p. 273; Schönland and Bak. fil. in Journ. of Bot. XL (1902), p. 91, t. 435.

South West Cape Colony extending to Namaqualand and the Karroo, but does not seem to reach the neighbourhood of Uitenhage (compare *C. rhombifolia* Haw.).

C. nana N.E. Br. in Gard. Chron. 3rd series XXX, p. 280 (1901), evidently belongs to this species though it has only a one-flowered peduncle. A similar specimen was found by Prof. Pearson in Little Bushmanland (see Schönland in Ann. of the South African Museum, IX (1912), p. 56).

32. *Col. mamillaris* L. f. suppl., p. 442; Thunberg, Fl. Cap. ed. Schultes, p. 397; DC. Prodr. 111, p. 398; Harvey in Fl. Cap. 11, p. 377; Bot. Mag. t. 6020.

C. filicaulis E. & Z. Enum. 307 (1837).

C. Marlothii Schönl. in Rec. Alb. Mus. 1, p. 59 (1903).

Namaqualand. The plant which I described as *C. Marlothii* was found at Laingsburg. It has shorter and somewhat blunter leaves than the type, but otherwise it agrees with the figure in Bot. Mag. t. 6020.

33. *Col. Marianae* Marl. in Trans. S.A. Phil. Soc. XVIII (1907), 47, t. V, fig. 4.

Clanwilliam, Namaqualand and Calvinia (Marloth 3489, MacOwan in Herb. Austr. Afr. 1860, Z. 2897, Schlechter 9833).

In addition to the differences from *C. mamillaris* already mentioned, this species is without the glandular prolongation of the connective found in *C. mamillaris*, and several allied species. The squamæ are deeply emarginate, leaving two pointed projections on each side, whereas in *C. mamillaris* the emargination is slight and the projections on each side are rounded off.

34. *Col. Cooperi* Bak. in Saund. Ref. Bot. I, t. 72 (1869); Schönland and Bak. fil. in Journ. of Bot. XL (1902), p. 11.

Zuurberg Range; Graaff Reinet (sometimes unspotted).

35. *Col. trigyna* Burch. Travels II (1824), p. 226; Schönland and Bak. fil. in Journ. of Bot. XL (1902), p. 91, where it is pointed out that the name is rather unfortunate.

C. Alstoni Schönl. et Bak. fil. l.c., p. 98.

This species was found by Burchell at Klairwater (between the Asbestos Mountains and Kuruman); from there it radiates westwards to Namaqualand, eastwards to the Transvaal (it is common near Pretoria) and in a southerly direction to Murraysburg, Hanover, Colesberg and Norval's Pont. Specimens in Herb. Bolus, have been compared with the type in Herb. Kew.

36. *Col. Bolusii* Schönl. in Rec. Alb. Mus. I, p. 59 (1903), *ibid.* p. 119. Mossel Bay (under 30 m.).

var. *karroensis* Schönl., *ib.* p. 119. Laingsburg.

The corolla lobes are not as long as stated in the original description. They have about the same relative length as in allied species, but are thickened in the centre and are on each side of this keel very thin, membranous.

37. *Col. rhombifolia* Haw. in Phil. Mag., 1825, p. 33; Baker in Saund. Ref. Bot. t. 36; Schönland and Bak. fil. in Journ. of Bot. XL (1902), p. 92.

? *C. maculata* Salm-Dyck Obs. 5 (1820); *C. alternans* Haw. Suppl. Pl. Succ. 26 ex Salm-Dyck l.c. (non Willd.); Baker in Saund. Ref. Bot. I, t. 35; Schönland and Bak. fil. in Journ. of Bot. XL (1902), p. 92.

This plant is common in coast districts from the neighbourhood of Port Elizabeth eastwards, and extends at least to Komgha. I agree with Mr. Baker that the plant figured by him is quite distinct from *C. hemisphaerica*. It is, however, a little doubtful whether the plant which he figured as *C. maculata* Salm-Dyck, is really that species. In any case, plants of *C. rhombifolia*, with spotted leaves are very rare, and it might thus be advisable in any case to retain Haworth's name, although *C. maculata* is an earlier name. The true *C. maculata* Salm-Dyck may be identical with *C. trigyna* Burch.

38. *Col. procurva* N.E. Br. in Kew Bull. (1912), p. 276. South Africa (exact locality unknown).

This species which is only known to me from description is according to the author allied to *C. triflora* Haw. (probably Thunb. is meant) from which it is distinguished by elongated, cuneate, much narrower leaves and procurved flowers.

39. *Col. cristata* Haw. in Phil. Mag. 1827, p. 123; DC. Prodr. 111, p. 399; Harvey in Flora Cap. 11, p. 377; Schönland and Bak. fil. in Journ. of Bot. XL (1902), p. 91.

C. clavifolia Haw. Phil. Mag. 1827, p. 274; Schönland and Bak. fil. l.c. p. 92.

C. aristata Walp. Rep. 11, p. 258, sphalm. ex Ind. Kew.

Common in the neighbourhood of Port Elizabeth and Grahamstown, also found at Somerset East and Graaff-Reinet.

40. *C. Zeyheri* Harv. in Fl. Cap. 11, p. 397 (1861-62); Schönland and Bak. fil. l. c. p. 377.

Z. 2571 from rocky places on the banks of the Kenkoriver east of the Buffeljagdsriver (Swellendam distr.)—This species should not be united with *C. cristata* Haw. as suggested by Mr. Baker and myself. The absence of bristles on the stem and the pubescent corolla separate it sharply from the former, as a re-examination of a type in the Herb. of the S.A. Museum has shown.

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Note on a new variety of *Kalchbrennera Tuckii* (Kalchbr. & MacOwan) Berk. from Grahamstown and Kentani Districts.

By I. B. POLE EVANS, M.A., B.Sc., F.L.S.

On the 8th of February last, Dr. Schönland very kindly sent me for examination from Grahamstown a phalloid fungus which he stated was new to him, and which was accompanied by a coloured illustration of the same.

Dr. Schönland in forwarding the specimen mentioned that "the only other phalloid from here which I know is *Kalchbrennera Tuckii* which I get pretty frequently."

The specimen was preserved in alcohol and consisted merely of a receptacle from which the volva was missing. This receptacle was composed of two distinct portions. A rather long cylindrical stalk of a creamy white colour, and a short dark green upper portion, the receptacle proper or pileus.

The stalk was hollow, and composed of 3-4 layers of spongy cells. It measured 5 cm. in length and 1.7 cm. in breadth.

The dark green portion or pileus was latticed and raised into folds. On the lattice work some 10-15 processes were borne. These were very short and coralloid and not more than 3-5 mm. in length.

The coloured illustration showed clearly that parts of this upper portion were bright scarlet when the specimen was fresh.

Very similar fungi and which were regarded as *Kalchbrennera Tuckii* (Kalchbr. & MacOwan) Berk., had previously been sent to me by Miss Alice Pegler from Kentani where they were collected on the 22nd December, 1914. Of these, one of the specimens exhibited a slightly better development of the processes of the receptacle, while another had them even less pronounced than that sent by Dr. Schönland. Along with these specimens I was

able to compare another somewhat similar fungus, which was also recently collected in mealie lands at Amabele in the Cape Province on the 22nd January, 1915, by Mr. P. A. van der Bijl of this Laboratory. In the fungus collected by Mr. van der Bijl the processes of the receptacle were well developed and numerous, but instead of being blunt and nail-shaped as is found in typical specimens of *Kalchbrennera Tuckii*, they were slender, tapering and almost whip-like in appearance.

All these specimens must be referred to the genus *Kalchbrennera*, which is characterised by having a sterile stalk, which bears a clathrate fertile portion, and from which coralloid projections proceed. The genus *Kalchbrennera* is known only from Africa, and consists of a single species *Kalchbrennera Tuckii*, which was first collected by Dr. Welwitsch in mealie lands in Praesidio, Pungo Andonga in Angola, in December 1856, and was first described as *Lysurus corallocephalus*, Welw. & Curr.

Specimens were next collected at Somerset East in the Cape by William Tuck, and these passed into the hands of MacOwan, Kalchbrenner and Berkeley. The latter in 1876 described the fungus under the name *Kalchbrennera Tuckii* (Kalchbr. & MacOwan) Berk. It has since been often collected in South Africa, and would appear to occur rather frequently in certain parts of Natal and the Cape Province. It has, however, so far as I am aware, not been collected as far north as the Transvaal or further inland.

In 1895 Hennings* described what he regarded as a variety of this fungus from Togoland under the name *Kalchbrennera Tuckii* (Kalchbr. & MacOwan) var. *clathroides* P. Henn.

This plant from the description given, differs from typical specimens of *Kalchbrennera Tuckii* in the much larger size of the receptacle or fertile portion in comparison with the stalk, and as Hennings remarks resembles rather a *Clathrus* with a stalk.

The specimen sent to me by Dr. Schönland is conspicuous chiefly for the relatively small size of the receptacle in comparison

*P. Hennings. *Fungi Camerun. I.* in Engl. Jahrb. XXII. 1895, p. 108.

with the stalk, and other differences as regards size, colour and small development of the processes are, I think, sufficient to regard it as a distinct variety of *Kalchbrennera Tuckii*, and I propose to describe it as *Kalchbrennera Tuckii* (Kalchbr. & MacOwan) Berk. var. *microcephala*.

The description is as follows :—

Kalchbrennera Tuckii (Kalchbr. & MacOw.) Berk. var. *microcephala* Pole Evans n. var.

Receptaculo cylindraceo, apice obtuso vel irregulariter rugoso, 6.5 cm. longo; stipite cylindraceo, cavo, 5 cm. longo, 1.7 cm. crasso, ceraceo-albo, e cellulis favosis irregularibus; parte sporifera 1.5 cm. alta, 1.5 cm. crassa, clathrato-pervia, coccinea, plicato-rugulosa, processibus subsimplicibus, brevissimis, extus pulpa olivacea sporarum vestita; sporis cylindraceo-oblongis, hyalinis $3-4.5 \times 2\mu$.

Grahamstown, Cape, leg. H. S. Wood, 8/2/1915 (Pole Evans No. 8952). Kentani, Cape, leg. Alice Pegler, 22/12/15 (Pole Evans No. 8846).



Naturalised Plants of Albany and Bathurst.

By F. S. SALISBURY, M.A. Cambr.

Several facts emerge from a study of the weeds and alien flora of this region of S. Africa.

1. The great similarity between the aliens of this district and of S. Australia. 95 out of 125 are common to both, for we must omit from the last total plants native of S. Australia but in the present list.
2. The much greater aggressiveness of aliens in S. Australia as compared with S. Africa. In S. Australia many aliens have invaded the bush or altered grass lands; such as *Cytisus canariensis* and a *Muraltia* in the bush, and many bulbs, composites, &c., in the turf. Few do so in S. Africa. It may be partly due to the direction of the current of settlement that very many of these S. Australian invaders came from S. Africa, while the entire alien Flora spontaneous in the district of the Cape here examined contains only five introductions from Australia, and these (Blue Gum, and four *Acacias*) with only a limited degree of spontaneity in the plantations S. of Grahamstown. But the early eastward direction of colonisation cannot be more than a very partial explanation after so many years of not inconsiderable traffic in the reverse direction.

Conversely, few indigenous plants invade areas of cultivation (even pastures) in S. Australia. But in S. Africa many native species compete successfully with alien weeds of cultivation in occupying neglected gardens and fallows. I might instance various crucifers, such as *Sisymbrium Burchellii*; *Mesembrianthemums*, as *M. angulatum*; species of *Nemesia*

like *N. melissaefolia*; *Oligocarpus calendulaceus*, which almost monopolises some weedy grounds; and various kinds of *Galenia* and neighbouring genera.

3. Some plants, such as *Foeniculum* and *Cotula*, adopt in the southern hemisphere a much damper habitat than in, at least, northern Europe, as if to belie the sentiment of Horace—

Caelum, non animum, mutant qui trans mare
currunt.

4. It is interesting to note the similar sequence of arrival in some species both in S. Africa and S. Australia, as, for instance, *Euphorbia Helioscopia* in both countries arriving apparently when *E. Peplus* is fully established. On the other hand *Sporobolus indicus*, if not native, must have arrived at the Cape long ago, whereas it has only lately been observed (1911) in S. Australia.

A preliminary List of Grahamstown Weeds was published in the S. African Agricultural Journal—Vol. vi, p. 508; and Vol. vii, p. 77. Since this list was compiled in the middle of 1913 a number of other species have come under my notice. The list up to the end of 1915 is as follows, and I have gone outside the designation of weeds to include all aliens established and growing spontaneously.

+ Species recorded by Rev. F. A. Rogers, "Provisional list of Flowering Plants and Ferns in the Divisions of Albany and Bathurst, 1909," but not seen by me. There are 13 such.

‡ Also included in Mr. Burt Davy's "Alien Plants Spontaneous in the Transvaal." 56, out of 131, occur in his list.

* Also included in Mr. J. M. Black's "Naturalised Flora of South Australia," 1909, and in papers subsequently contributed by him to Transactions of the Royal Society of S. Australia. They number 95.

[] The records in square brackets have been added recently by Dr. S. Schönland at my request, and a few by Miss L. L. Britten, B.A. However, no alteration has been made to Mr. Salisbury's figures as given above. [Editor.]

CONIFERAE.

[*Pinus pinaster* Soland. This native of the Mediterranean Region is spreading very rapidly on the hills south of Grahamstown. *P. halipensis* Mill. from the same region is also spreading but not to the same extent as *pinaster*.]

PAPAVERACEAE.

†*Papaver aculeatum*, Thunb.

*†*Papaver Rhoeas*, Linn.

‡*Argemone mexicana*, Linn. Prickly Poppy.

Waste ground south of Rhodes Hostel, Grahamstown, arable land at Middledrift, &c. Native of Mexico, from which country it was introduced to European cultivation in 1592.

FUMARIACEAE.

**Fumaria officinalis*, Linn. Fumitory. On arable land and along fences. European, and widely distributed also over Asia, S. Africa, Australia ("pink-weed"). Oliver (Flora of Tropical Africa) quotes records from Abyssinian cornfields and along the White Nile.

CRUCIFERAE.

*†*Nasturtium officinale*, R. Br. Watercress. Beds of watercourses. Is self-fertilised if not visited by insects: hence its prolific multiplication.

**Sisymbrium officinale*, Scop. Hedge Mustard. Waysides among cultivated lands. A native of Europe and the temperate parts of Asia, but occurs as an introduced weed in the southern states of Australia.

*‡*Senebiera pinnatifida*, DC. Lesser Swine-cress or Wart Cress. A common weed of waste ground. Native of the Argentine: naturalised also in Europe and Australia. The earliest British record seems to be Aug. 1, 1794, when Mr. J. Adames found it at Dale, a village near the entrance of Milford Haven. Journal of Botany, vol. xli.

*‡*Capsella Bursa-Pastoris*, Moench. Shepherd's Purse. A common weed of gardens, wastes, and arable, accompanying agriculture all over the world, though native of Europe. Schimper records it as a weed of agriculture in Abyssinia,

and in Jamaica (Flora of Jamaica, Fawcett and Rendle) it is a weed of waste places and coffee-fields in the mountains.

*‡*Brassica campestris*, Linn. Wild Rape. Escaped from cultivation.

**Diplotaxis muralis*, Linn. European. An occasional garden weed in Grahamstown. The deeper acute-lobed form (apparently var. Y of DC) occurred in garden at Bishopsbourne Cottage, Grahamstown. Mrs. T. V. Paterson sends the type (foliis dentatis) from Humewood, Port Elizabeth.

*‡*Raphanus Raphanistrum*, Linn. Jointed Charlock, or Wild Radish. Both the white and yellow flowered forms are found as arable weeds, and obviously, from their close association, from a common parent. Abundant. The cultivated form is always white, i.e. the more highly evolved colour. It more often than not reverts to yellow again when it goes wild, but this fades to the white form even before actually withering.

**Rapistrum rugosum*, All. Turnip-weed. European. On the Kowie Ry. embankment at Grahamstown; beside Carlisle Street, in a garden in Beaufort Street.

RESEDACEAE.

Reseda odorata, Linn. Sweet Mignonette. Egyptian. Grows as an escape scattered over some of the lands at Beaconsfield, near Grahamstown.

CARYOPHYLLAE.

*‡*Silene gallica*, Linn. French Catchfly. Gunpowder Weed of the early colonists, because the seeds resembled gunpowder. A common wayside weed. European.

*‡*Stellaria media*, Linn. Chickweed. European. The abundance of this plant wherever settlement extends is due to the fact that its inconspicuous little white blossoms are capable of self-fertilisation, and that individual plants begin to flower when only a few weeks old, and can ripen seed whenever the thermometer stands above freezing point.

**Cerastium viscosum*, Linn. Mouse-ear Chickweed. [In waste ground near Grahamstown. S. Sch.]

**Polycarpon tetraphyllum*, Linn. Polycarp. [Common in cultivated lands and in lands which have been cultivated at one time and then abandoned. S. Sch.]

**Spergularia media*, Pers. Sand Spurrey. Occurs inland in brack vleis, as in the hollow beside the Kowie Ry. embankment behind Grahamstown Station; and is also abundant in coastal salt-marshes and on saline flats, as at Port Alfred.

*†*Spergula arvensis*, Linn. Corn Spurrey. Native of Europe. An arable and garden weed near Grahamstown; e.g. on Stone's Hill, where it is abundant.

PORTULACACEAE.

*†*Portulaca oleracea*, Linn. Common Purslane. S. European. Common in gardens and on waste land.

MALVACEAE.

**Lavatera arborea*, Linn. Tree Mallow. More or less established as a spontaneous plant in gardens and edges of market-garden lands in and near Grahamstown.

**Malva nicaeensis*, All. Mallow of Nice. Probably often overlooked in consequence of its similarity to the following species, but clearly distinguishable by the *ovate* bracts attached *near the middle* of the calyx.

*†*Malva parviflora*, Linn. Small-flowered Mallow. Varies much in habit, from prostrate on dry sandy soil, to erect and two feet high on garden ground. Always distinguishable by the three *narrow linear* bracts attached *near the base* of the calyx. Native of Mediterranean region.

‡*Sida rhombifolia*, Linn. Paddy's Lucerne: Pretoria Weed. Doubtless often overlooked in consequence of its similarity to the native *Sida longipes*, but at once known by the little cone of sharp spines in the middle of the fruit. Common along African Street, near Public Baths, &c., &c.

GERANIACEAE.

**Erodium moschatum*, Willd. A common wayside plant and on weedy garden ground.

‡*Oxalis corniculata*, Linn. Beak Oxalis: Yellow Sorrel, Southern Europe. Now cosmopolitan in warm latitudes. Mr.

J. M. Black treats this as indigenous to Australia, and omits it from his Flora. Possibly native also of Africa. By 1859 (Flora Capensis, vol. i) it was already found "everywhere in cultivated ground, throughout the colony and Caffraria."

LEGUMINOSAE.

**Trifolium angustifolium*, Linn. Narrow-leaved Clover. Wilde Rooi Grass. South European. Only once seen by the writer in Grahamstown, but was apparently introduced into the colony at an early date, since Harvey, Fl. Cap. vol. ii (pub. 1861-2), speaks of it as naturalised near Cape Town, &c.

**Melilotus parviflora*, Desf. Small-flowered Melilot.

**Medicago denticulata*, Willd. Toothed Medick. European. Abundant.

†*Medicago nigra*, Willd.

Medicago aschersoniana, Urban. In waste places near Grahamstown, e.g. between and beside the metals on the railway south of the Cradock Road; near the swimming bath, Kingswood College; Beaconsfield, near Grahamstown. Native of Northern Africa.

*‡*Medicago sativa*, Linn. Lucerne, Alfalfa. Originally from Media, but brought into southern Europe in ancient times. It was celebrated as the plant on which the swift breed of Median horses was fed. Occurs in and about Grahamstown as a roadside waif.

*‡†*Vicia sativa*, Linn. Common Vetch. European. I have not seen it near Grahamstown, but received a piece, of a form which was evidently a recent escape from cultivation, from near Port Elizabeth.

[*Cassia tomentosa*, Lam. Grahamstown, especially along watercourses. L.L.B.]

**Acacia decurrens*, Willd. Sydney Tan-Wattle. Native of New South Wales. Planted in the neighbourhood of Grey Reservoir, Grahamstown, and spontaneous locally.

Acacia dealbata, Link. Silver Wattle. Native of S.E. Australia. More or less spontaneous in the woods about Grey Reservoir.

Acacia longifolia, Willd. Long-leaved Wattle. Native of S.E. Australia. Sub-spontaneous near Grey Reservoir, and in moist spots under the Grahamstown plantations.

Acacia melanorhylon, R. Br. Black-Wood Wattle. S.E. Australia. Spontaneous in moist parts of Grahamstown plantations. Although this is a phyllodineous species, it readily produces true leaves at the extremity of trimmed branches, or where nibbled by animals; and normally does so at the tops of uninjured shoots also when under moist shade.

[ROSACEAE.]

[*Fragaria Indica* L. This wild strawberry is spreading in some plantations near Grahamstown.]

[*Prunus Persica* (L), Sieb. et Zucc. The Peach. Native of North China. Springs up frequently in gardens from seed.]

MYRTACEAE.

‡*Eucalyptus globulus*, Labill. Blue-Gum. Very largely planted and sub-spontaneous in moist deep soil near Grahams-town. The slower-growing persistent-barked species (stringy-barks), such as *E. obliqua* and *E. capitellata*, whose natural habitat is shallow soiled ridges, especially of quartz and sandstone rocks, do not seem to spread so readily. *E. globulus* is native of alluvial soils in Victoria and Tasmania. A useful marsh-drainer.

LYTHRARIÆ.

**Lythrum hyssopifolium*, Linn. Borders of upper feeders of Kowie River.

ONAGRARIÆ.

‡*Oenothera biennis*, Linn. Evening Primrose. Abundant along the stream running down Belmont Valley, and occasionally spontaneous in gardens.

**Oenothera odorata*, Jacq. S. America. Roadsides.

‡*Oenothera rosea*, Ait. Roadsides and waste places. Southern N. America.

†*Epilobium hirsutum*, Linn.

Epilobium tetragonum, Linn. Abundant in the open trough of a watercourse on "Glen Heath" Farm, Martindale [Coldspring S. Sch.]

CACTACEAE.

**Opuntia monacantha*, Haw. Single-thorned Prickly Pear. Joints comparatively thin, and grass-green when growing under shade. The flowers are yellow, not orange, and the thorns are single at each cushion on the uppermost segments, but become clustered on the older ones. This and the two following are frequently confused. Native Central America and Brazil.

Opuntia Tuna, Mill. Cluster-thorned Prickly Pear. Joints rather thick, with greyish bloom. Flowers orange. Thorns bright yellow, clustered even on the uppermost segments. Native of West Indies. *O. Tuna* grows along the fence of a field in Cawood Street, Grahamstown, while *O. monacantha* forms a hedge by the footpath up to Sugarloaf Hill.

‡*Opuntia Ficus-indica*, Mill. Indian Fig. Joints longer than either of the preceding, and often scarcely armed, or with a single quite short (less than $\frac{1}{2}$ -in.) thorn at each cushion. Greyish "bloom" on the segments. Less common than the two former near Grahamstown. Cultivated for its fruit. Native of Mexico.

Opuntia pusilla, S-D. Pin-pillow or Jointed Cactus. The segments of this species break off entire and are carried away on the wool or fur of animals or on clothes. It is a much lower plant and smaller in all its parts than the other species, and is less likely ever to prove of economic value, even as a source of motor-spirit.

[PASSIFLORACEAE.]

[A few species of *Passiflora*, especially one which appears to be *P. coerulea* L., a native of Brazil, appears in hedges.]

UMBELLIFERAE.

†*Sanicula europaea*, Linn. [In a wood near Coldspring.]

**Apium graveolens*, Linn. The tall (2ft.) robust form, which is doubtless an escape from cultivation, is frequent along banks of the Kowie River just below and in Grahamstown.

var. *decumbens*. This much slenderer, lower, and in all its parts smaller form grows in a rock pool in Blaauwkrantz Gorge.

**Foeniculum officinale*, All. Abundant along banks of Kowie and feeders in and below Grahamstown. Similarly in Australia it forms thickets in very wet soil just to the rear of the reed fringe. In England, on the other hand, it grows up the faces of cliffs. *Cotula coronopifolia* presents a like contrast in its European and S. hemisphere habitats.

**Caucalis nodosa*, Scop. Waysides at Grahamstown. Uncommon.

RUBIACEAE.

†*Galium Aparine*, Linn.

DIPSACEAE.

Scabiosa Columbaria, Linn. Small Scabious. Perhaps indigenous, grassy veld. Abundant.

COMPOSITAE.

**Centaurea solstitialis*, Linn. Yellow Star-thistle.

[*Centaurea calcitrapa*, Linn. Europe, Asia and N. America. Farm Beaconsfield, near Grahamstown. S. Sch.]

[*Centaurea melitensis*, L. Maltese Star-thistle. Drostdy, Grahamstown. S. Sch.]

**Carduus tenuiflorus*, Curtis. Slender Thistle. Rubbish tips on waste ground south of Rhodes Hostel.

**Silybum marianum*, Gaertn. Holy Thistle [Locally known as Scotch Thistle.] Deep loose soil, as on Kowie Railway embankment near Grahamstown Station [and throughout Grahamstown in suitable places].

[*Aster* sp. An undetermined sp. has become a troublesome weed within the last few years in Grahamstown and Port Alfred. L.L.B.]

‡*Erigeron canadensis*, Linn. Canadian Horse-weed. Recorded in error for *E. linifolius* in many parts of S. Africa and Australia. Probably the Transvaal plant may prove to be *linifolius*. *E. canadense* has come up now and then, generally

only one or two plants, in several gardens in Grahamstown. Foliage dark green and ciliate.

**Erigeron linifolius*, Willd. Flax-leaved Horse-weed. Covered all over with long greyish hairs. Native of Mediterranean region. Abundant as a wayside weed in parts of Australia, in Durban, and E. Province of Cape Colony, and Cape Town. At the National Botanic Gardens, Kirstenbosch, I noted both this and the preceding species in January, 1916.

Bellis perennis, Linn. Daisy. Only seen in one shady lawn in Grahamstown.

**Galinsoga parviflora*, Cav. Weed of cultivated land.

‡*Bidens pilosa*, Linn. Black-Jack. West Indies. Common weed of cultivated ground. Occasionally also in moist kloofs. A specimen in the Donker-bos, Stone's Hill, showed the rayed form of the species, which is usually only discoid. [Rayed form also seen in Grahamstown Location. L.L.B.]

[*Bidens bipinnata*, Linn. North America. A recent comer, now a rapidly spreading weed in Grahamstown. L.L.B.]

Cotula coronopifolia, Linn. Soldier's Buttons. Perhaps native both in Africa and Australia. Common in both countries in wet places. In Europe its habitats are dry. Index Kewensis says S. African. Nyman, *Conspectus Florae Europae* says " ? American origin " (p. 380, and see Suppl. p. 171).

‡*Gnaphalium luteo-album*, Linn. Jersey Cud-Weed. Native of Southern Europe, and extending as far north as the Channel Islands. Perhaps indigenous both in S. Africa and Australia.

[*Senecio Jacobaea*, L. Ragwort. A solitary specimen doubtfully referred to this found at Port Alfred. L.L.B.]

**Senecio vulgaris*, Linn. Groundsel. Garden weed.

*‡*Tragopogon porrifolius*, Linn. Salsify. Native of Mediterranean region.

**Urospermum picroides*, Desf. Weedy places, especially near Showground, Grahamstown.

*‡*Sonchus oleraceus*, Linn. Sow-Thistle. European. Very common weed of gardens and arable. Both *S. oleraceus* and the larger, robuster, and pricklier *S. asper* occur, but the latter is much less frequent. The foliage forms of *S. oleraceus*

show very great variety. Note especially the margin and base of the highest leaf.

†*Zinnia multiflora*, Linn. [Farm "Birmingham New" in barley fields, &c.]

[*Schkuria bonariensis*, Hook. Found recently in Albany Museum grounds on earth thrown up from foundations of new wing. L.L.B.]

[*Tagetes minuta*, L. A troublesome weed in orchards, &c., at "Mesopotamia," near Grahamstown, lately also observed in Grahamstown. Native of Tropical America. S. Sch.]

*†*Xanthium spinosum*, Linn. Bur-weed. Common by waysides and on waste ground.

PRIMULACEAE.

**Anagallis arvensis*, Linn. Scarlet Pimpernel. I have only found the typical scarlet form in Albany on the lands at Glen Heath, Martindale, where the blue also occurs. But I noted both at Kirstenbosch, near Cape Town. [The scarlet form was also found by Mr. J. Hewitt at Belmont Valley.]

*†var. *coerulea*. Blue Pimpernel. This is the common form, and very abundant as a weed of gardens, waysides, and lands in Albany and Bathurst, and appears to be a pure strain, as it is never mixed with the red. So far as my observations go, extending over three years, it is the only form in and near Grahamstown.

Samolus Valerandi, Linn. Brookweed. Apparently cosmopolitan. By rock-pools in wet kloofs, very abundant, for instance in kloofs on "Glen Heath" Farm, Martindale.

APOCYNACEAE.

**Vinca major*, Linn. Great Periwinkle. Very abundant along several feeders of the Kowie in Grahamstown, and along some fences. European.

ASCLEPIADACEAE.

[*Auraujia sericifera*, Bert. Native of S. America, is very frequent in hedges.]

BORAGINEAE.

†*Myosotis sylvatica*, Hoffm. Wood Forget-me-not.

*†*Lithospermum arvense*, Linn. Corn Gromwell. European. The root yields a red dye. Uncommon. One or two specimens at Grahamstown.

**Echium violaceum*, Linn. Viper's Bugloss. Sometimes occurs by waysides at Grahamstown, and is abundant in some farm lands to the north; but it never gets out of hand or becomes the terrible pest which it is in Australia near the Victorian border in N.S.W. In Australia it is known as Blue Weed or Paterson's Curse.

CONVOLVULACEAE.

Convolvulus arvensis, Linn. Field Convolvulus. Common as a garden weed where its horizontal underground stems, of which the visible parts are branches, make it very difficult to eradicate.

SOLANACEAE.

*†*Solanum nigrum*, Linn. Black Nightshade. Cosmopolitan. Perhaps the crenate-leaved form is indigenous.

†*Solanum pseudo-capsicum*, Linn. Native of Madeira. Along fences, escaped from cultivation, in Grahamstown.

*†*Solanum sodomaeum*, Linn. Devil's Apple. Probably of Eastern Mediterranean origin. Common on waste ground. [Several other species of S., e.g. *S. giganteum*, Jacq., though fairly common, only occur on waste ground and are undoubtedly introduced.]

**Physalis peruviana*, Linn. Cape Gooseberry; but native of S. America. It received its popular name in Australia, which it reached by way of the Cape in the early days of settlement.

[*Nicandra physaloides*, Linn. Peru. Cultivated land and waste places, fairly common. L.L.B.]

*†*Datura stramonium*, Linn. Thorn Apple: Stink-Blaad. A common and very poisonous weed of cultivated ground.

*†*Nicotiana glauca*, R. Graham. Tree Tobacco. Native of Argentina. Common along watercourses, and in rich soil.

[*Cestrum viride*, Moric. Native of Mexico, springs up occasionally in waste ground near gardens.]

SCROPHULARINEAE.

*†*Verbascum virgatum*, Stokes. [Occasionally in gardens. S. Sch.]. [Collected at Signal Hill. L.L.B.]

*††*Veronica Anagallis*, Linn. Brook-lime. European.

‡*Veronica Buxbaumii*, Tenore. European. Syn. *V. Tournefortii*, C. C. Gmel. An occasional garden and arable weed.

VERBENACEAE.

[*Lantana camara*, Linn., is wild at Port Alfred, and occurs in places in Grahamstown. Tropical America. L.L.B.]

LABIATAE.

**Marrubium vulgare*, Linn. Only twice noted by Grahams-town waysides. It cannot be said to have established itself among the weed flora as yet.

PLANTAGINEAE.

*†*Plantago major*, Linn. Bird Plantain: "Sago." European.

*†*Plantago lanceolata*, Linn. Ribgrass. European.

ILLECEBRACEAE.

[*Herniaria hirsuta*, L. Europe, North Africa, &c. Cultivated land, Lower Albany. S. Sch.]

[*Corrigiola littoralis*, L. Europe, Tropical Africa and S. America. Cultivated land, Lower Albany. S. Sch.]

[*Scleranthus annuus*, L. Europe, North and Tropical Africa. Cultivated land, Lower Albany. S. Sch.]

AMARANTACEAE.

**Amarantus retroflexus*, Linn. Native of America. A very common weed in gardens and arable lands.

[*Amarantus viridis*, L. Native of Tropical Africa and India.]

[*Cyathula globulifera*, Mog. Native of Sub-tropical Africa. Waste ground, Belmont Valley. S. Sch.]

[*Alternanthera Aechyrantha*, R. Br. Native of Tropical S. America.]

CHENOPODIACEAE.

*†*Chenopodium murale*, Linn. Nettle-leaved Goose-foot. European. A common weed of waste cultivated ground.

*†*Chenopodium album*, Linn. White Goose-foot. A common weed of cultivated ground.

*†*Chenopodium ambrosioides*, Linn. Mexican Tea. Native of Tropical America. An occasional weed of waste ground in Grahamstown.

Chenopodium vulvaria, Linn. Common along garden fences in Grahamstown.

Chenopodium sp. (allied to *Ch. album*). Cultivated lands: much taller than *Ch. album*.

[*Roubigia multifida*, Moq., a native of S. America, is an occasional weed in gardens.]

[*Atriplex halimoides*, Lindl., a native of Australia, is found on brack soils.]

[PHYTOLACCACEAE.]

[*Phytolacca dioica*, L., a native of S. America, is spreading especially towards the coast.]

POLYGONACEAE.

*†*Polygonum aviculare*, Linn. Knot-weed. European. Prostrate on open ground: erect among crops. A common weed of wastes, gardens, and arable.

*†*Polygonum convolvulus*, Linn. Black Bindweed. European. Garden and arable weed.

*†*Rumex Acetosella*, Linn. Sheep-sorrel. Weed of sandy soils.

*†*Rumex crispus*, Linn. Curled Dock. The form in Albany almost always has three well-developed tubercles.

Rumex obtusifolius, and *R. pulcher* seem also to occur, but I did not succeed in getting adequate material for their determination.

[BASELLACEAE.]

[*Boussingaultia baselloides*, H.B. et K., native of Ecuador, is a troublesome weed in hedges.]

EUPHORBIACEAE.

**Euphorbia Helioscopia*, Linn. Sun-spurge. Common in some gardens at Grahamstown, but not so universal by any means as *E. Peplus*. It occurs in two quarters of the city and will doubtless gradually extend itself over most of the area of the other species. Sun-spurge was the later in arriving in S. Australia also.

**Euphorbia Peplus*, Linn. Petty Spurge. A weed of every garden.

[*Euphorbia indica*, L. India. Very plentiful in gardens in Grahamstown. L.L.B.]

*†*Ricinus communis*, Linn. Castor-oil Plant. Native of India and perhaps of Tropical Africa. The foliage is very poisonous to stock, and the beans extremely noxious. Occurs on loose soil and by moist waysides, and is specially abundant in the neighbourhood of water.

URTICACEAE.

*†*Cannabis indica*, Linn. Indian Hemp. Dagga. A common garden and arable weed. It should be noted that two native labiate plants, *Leonotis Leonurus*, R. Br., and *Leonotis ovata*, Spr., are also called Common Dagga and Klip Dagga respectively. All three species are smoked with very injurious results by the Kaffirs.

**Urtica urens*, Linn. Small Nettle. A common weed of garden ground and waste corners. I have not seen *U. dioica* anywhere in Albany or Bathurst.

AMENTACEAE.

*†*Populus alba*, Linn. White Poplar, Abele. European. Occurs self-sown along the upper feeders of the Kowie at Grahamstown.

*†*Salix babylonica*, Linn. Weeping Willow. Asiatic. Frequent along streams where the native bush has been removed or disturbed and opened up.

[PROTEACEAE.]

[An undetermined species of *Hakea* with the aspect of *H. acicularis*, R. Br., is rapidly spreading on the slopes south of Grahamstown, forming dense thickets in some places.]

AMARYLLIDACEAE.

*†*Agave americana*, Linn. Sp. Pl. 323. American Aloe. Native of Mexico. Commonly used for fences of fields, and occasionally strays on to waste land where rubbish is shot.

*var. *variegata*. Found occasionally with the common sort on rubbish-tips, as below Sugarloaf Hill, Grahamstown.

LILIACEAE.

[*Allium triquetrum*, L. A troublesome weed in some Grahamstown gardens. S. Sch.]

GRAMINEAE.

**Digitaria sanguinalis*, Scop. Finger-grass.

*†*Phalaris minor*, Retz. Lesser Canary Grass. Native of Mediterranean region.

**Sporobolus indicus*, R. Br. Indian Dropseed Grass. Perhaps indigenous. A dominant factor in altered grass veld. See also its occurrence in similar habitat in Natal.—Prof. J. W. Bews, Annals of Natal Museum, II, Pt. iv, Aug. 1913.

var. *laxus*, Stapf. In rich soils.

[*Setaria verticillata*, Beauv., Klis gras or Klitz, frequent in cultivated land. L.L.B.]

Sporobolus pungens, Kunth. Perhaps indigenous. Common also to Australia. Occurs not only on saline wet flats and depressions along coast but also in brack vleis inland: e.g. in hollow beside Kowie Railway embankment at Grahamstown. In both cases it is dominant and associated with an intermixture of *Plantago carnosus*, *Spergularia media*, and *Polypogon monspeliensis*.

**Polypogon monspeliensis*, Desf. Beard-Grass. Kowie Flats, Port Alfred, and inland brack vleis. See under *Sporobolus pungens*.

*†*Aira caryophyllea*, Linn.

*†*Avena sativa*, Linn. Common Oat. A wayside escape, and occurs in fallows.

**Avena fatua*, Linn. European. Weed of cultivated ground.

*†*Cynodon Dactylon*, Pers. Dog's-tooth Grass, or Bermuda-grass. Cosmopolitan in warmer regions [perhaps indigenous. S. Sch.].

Ammophila arundinacea, Host., Marram grass, European, has been planted extensively at Port Alfred to fix the sand dunes and has now established itself. L.L.B.]

†*Eleusine indica*, Gaertn. Goose-grass. Tropical Asia and Africa.

**Vulpia bromoides*, S.F.G.

*†*Briza maxima*, Linn.

*†*Briza minor*, Linn.

†*Poa annua*, Linn. Annual Meadow-grass. Native of north temperate parts of Old World. This is the weed which comes up along paths after rain at all times of the year.

**Bromus marimus*, Desf.

*†*Bromus unioloides*, H.B.K. Prairie-grass, or Rescue-Grass. Native of N. and S. America. A common weed of waste edges and corners of cultivated ground, and waysides.

**Lolium perenne*, Linn. Waysides.

**Lolium multiflorum*, Lam. Waysides and lawns.

*†*Lolium temulentum*, Linn. Darnel. European. Occurs in cornfields. A parasitic fungus in the grain renders this species very poisonous, and grain from fields where darnel occurs should always be screened before grinding. It is abundant in most cereal crops round Grahamstown.

**Secale cereale*, Linn. An occasional roadside waif.

**Hordeum murinum*, Linn. [Common in some parts of Grahamstown as a roadside weed.]

KLINGIA, a new genus of **Amaryllidaceae**.

By S. SCHÖNLAND.

KLINGIA nov. gen.

Herbae bulbiferae, bulbo tunicato. Folia numerosa serotina anguste linearia basi valde dilatata vaginantia. Flos solitarius. Perianthium marcescendo-persistens tubo longo gracili apice vix ampliato, lobis 2-seriatis subaequalibus oblongo-lanceolatis suberectis. Stamina 6 uniseriata fauci affixa perianthii lobis multo breviora, filamentis apice liberis caeterum inter se et cum perigonio concretis, antheris basifixis per anthesin spiraliter tortis. Stilus filiformis perianthii tubum paulo superans, stigmatis brevissimis obtusis. Fructus ignotus.

Aff. *Gethyllis* L., differt filamentis inter se connatis et perianthio adnatis.

Species unica :

Klingia namaquensis n. sp. (Text figs. 1 and 2.)

Bulbus tunicatus depresso-globosus 6-8.4 cm. diam., tunicis membranaceis griseis apice in collo conico circ. 6 cm. longo productis. Folia numerosa serotina marcescendo-persistentia glabra anguste linearia 7-8 cm. longa circ. 1.5 mm. lata, vagina lata membranacea. Flos solitarius fragrans. Perianthii tubus albus gracilis subcylindricus trisulcatus apice vix ampliatus partim subterraneus, lobi extus pallide rosei intus albi circ. 5.5 cm. longi e basi subhorizontali erecto-patentes vel suberecti biseriati subaequales oblongo-lanceolati obtusi mucronati, mucrone parvo obtuso incurvato et squama membranacea pendula lineari-lanceolata ornata. Stamina 6 uniseriata fauci affixa, filamentis apice liberis subulatis caeterum dilatatis in corona subplana 6-lobata subcarnosa connatis et partibus basalibus perianthii lorum adnatis, antheris basifixis per anthesin spiraliter tortis. Stilus gracilis ex fauci paulo emergens, stigmatis minutis obtusis.

Hab. Richtersveld, Namaqualand. Coll. Rev. H. Kling,

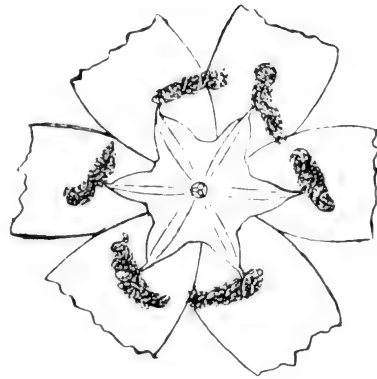


Fig. 2.—Flower seen from above with the upper portion of the petals removed.

Fig. 1.—*Klingia*, plant $\frac{1}{2}$ natural size, and tip of petal enlarged.

Bulb tunicate (outer tunics membranous, greyish), depresso-globose, 6 to 8.4 cm. in diameter, produced into a conical neck of dry membranous leaf-sheaths about 6 cm. long. Leaf-blades at the flowering period dried up, glabrous, narrow linear, about 7.5 cm. long and about 1.5 mm. broad. Perianth with a very long, partly underground tube, widening

very slightly and gradually near the lobes, protruding about 3.5 cm. above the neck of the bulb, white, with 3 slight furrows corresponding to the median line of the outer perianth-lobes. The lobes are about 5.5 cm. long, oblong-lanceolate, obtuse, with a small obtuse incurved mucro, from which projects downwards a small, narrow, pointed, membranous process, variable in length (up to 3 mm.). The lobes are pink outside, white inside, more or less suberect, slightly carinate. There are 6 stamens in one whorl arising from the mouth of the perianth which are much shorter than the perianth-lobes. The filaments are to a great extent united to form a white, somewhat fleshy 6-lobed corona which is united to the base of the perianth-lobes. The uppermost parts of the filaments are subulate. The anthers are basifixed, have yellow pollen and become spirally twisted when the flower has opened. The delicate style emerges from the perianth-tube by about 3 mm., the stigma is minute, obtusely 3-lobed. The fruit is unknown.

Two bulbs were received in September 1918 from the Rev. H. Kling, Steinkopf, Namaqualand, to whom our Museum is indebted for many valuable botanical, zoological, mineralogical and anthropological specimens, and to whom I have pleasure in dedicating this new genus. The bulbs were laid aside and actually forgotten until in December one of them made its presence felt by the strong fragrantcy of its flower.

It seems quite plain that the plant is closely allied to *Gethyllis*. In this genus there is, however, never found a corona, which is such a striking feature of our plant, a corona which reminds us of the similar structure in *Pancreatium*. Cohesion of stamens in *Gethyllis* is only known in some species where the number of stamens is increased (evidently by chorisis) and then only the groups representing the single stamens of the species with hexamerous androecium may be united amongst themselves (see e.g. *G. Brittenianus* Bak. in Journ. of Bot. 1885 t. 260 and the detailed description of *G. polyanthera* Sol. [= *G. ciliaris* L.f.] published by Britten in Journ. of Bot. 1884, 148 of which Baker in Journ. of Bot. 1885, 227 and Flora Cap. vi, 196 says "filaments confluent" which is quite a misleading statement).

As only one flower was available I pollinated it in the hope of getting the fruit. In this I was disappointed. This accounts, however, for certain omissions in the description. Thus the whole length of the perianth-tube has not been stated and the ovary has not been described. These and some other items could easily have been ascertained if I had not wished to leave the flower undisturbed. Only its upper portion was preserved. I hope to be able to make good these omissions at some future date, when I hope to be able to describe also the fruit and seeds.

**Anhydrophyrne rattrayi, a remarkable new frog from
Cape Colony.**

By JOHN HEWITT.

[Plate V.]

Some time ago, Dr. Geo. Rattray of East London presented to the Albany Museum a small collection of zoological material obtained by himself and Mr. John Wood during a summer holiday at the Hogsback, Amatola Range. It included, along with the frog now described, several species of little known animals which are commonly found in our forest regions, viz., a peripatus (*Peripatopsis moscleyi*, Wood. M.) and a jumping terrestrial amphipod Crustacean (*Talitriator eastwoodae* Meth.). There was also a specimen of a rare lizard, *Tetradactylus laeviscauda* mihi, only previously known from Tabamhlope, Natal. Dr. Rattray's report was of special interest. He wrote as follows:—

'We hunted for long days for the tadpoles you wanted (Heleophryne) without success, but I found the *nests of a frog*. They were spherical, about an inch in diameter, just under the surface of the ground and contained about 20 eggs. The whole cycle of development must be completed in the nest.'

Now this is the first actual record of any such habit amongst the amphibians of Southern Africa. It is quite certain that the great majority of our frogs and toads have free swimming tadpoles, and are completely dependent on the water of pools or streams for the maintenance of the race. However, future observers will probably find a similar habit amongst a few other species. I believe indeed that *Breviceps*,* commonly known as 'Jan Blom,' cannot have a free swimming tadpole: at any rate, its eggs are large and comparatively few in number, and the creature is never found in my experience near water.

*Dr. R. Broom tells me that a species of *Breviceps* occurs at Port Nolloth where there is no water on the surface within 50 miles.

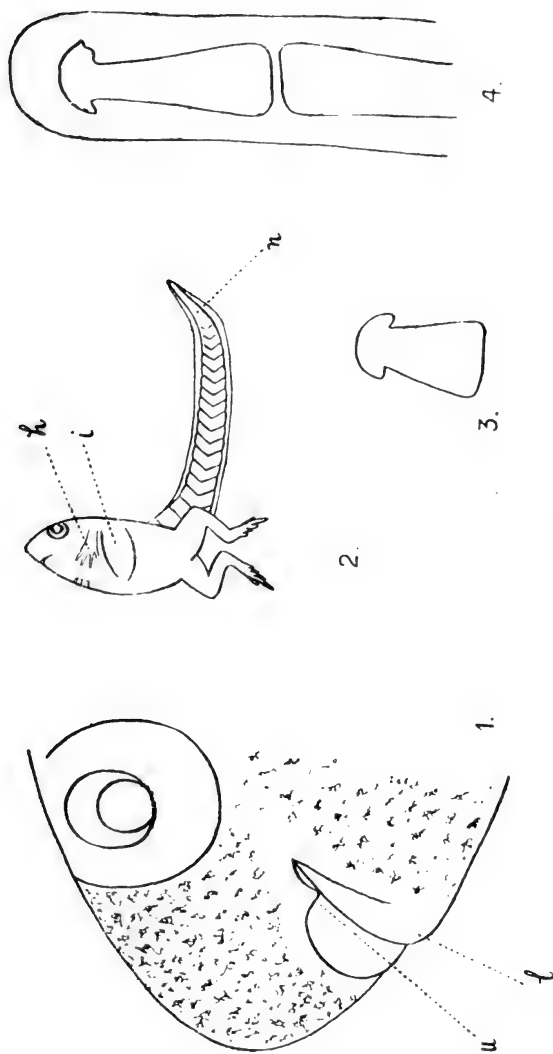
A further detailed account from the discoverer reads thus:—'The Hogsback hotel is situated on a narrow plateau at the top of the Tyumie Valley, and my aneroid gave the height at 3,600ft. The Southern edge of this plateau is bounded by the steep forest-clad slope which descends rapidly to the Tyumie Valley. It was in the depths of this forest that I found the nests. Three of them occurred on bare patches of ground, but the rest were among a sparsely growing forest grass. The nests were almost spherical, about an inch in diameter, with the vertical diameter slightly less than the horizontal. The inner surface was quite smooth, and a small air-hole opened on to the surface of the ground and projected a little above it. The nests occurred just as far away from water as was possible in a locality abounding with streams, for those I found were on a slight watershed between two streams. The sides of the nest were damp—they could not be otherwise with rain five days a week, but there was no free water in the nests. The eggs were white with just a tinge of yellow, numbered about 20, and were embedded in a transparent jelly. The great majority of the embryos consisted of an outwardly little differentiated body and a huge yolk-sac. They struck me as being much more fish-like (trout or salmon) in appearance than those of any frog I could remember seeing. The free tail, when not in motion, was curled round the yolk-sac. Those which I took home at this stage had developed black eyespots at the end of three days, and in three weeks the sole survivor had reached the stage indicated in the specimen I sent you, i.e. with well developed hind limbs, forelegs visible under skin, and pigmentation of the skin proceeding from the snout backwards. I could find no trace of gills at any stage. The adult frog with which I came to associate the eggs was abundant, and I shall not be surprised if some observer finds that the parent keeps a watchful eye on the developing offspring.'

Writing from Hogsback in January 1919, at a time of widespread drought, Dr. Rattray reports:—'Nests were not so easily found as last year, and it is evident that this toad requires a certain degree of moisture, for even the comparative

drought which Hogsback has been undergoing plainly destroyed many broods. I could find no newly deposited eggs, but on the other hand found one or two nests with frogs in almost the adult form. I tried a few crude experiments of transferring the embryos to water in the hope of upsetting the normal development and making it revert to that of the order but only succeeded in drowning the specimens. There is a small hole left at the top of the nest, quite large enough for the young to get out, and even if the hopping of 16-20 young frogs does not break down the slender roof, a youngster who can climb to the top of a tobacco tin would find little difficulty in emerging from a nest whose opening is level with the ground. I do not think that the whole course of development can take more than 7 or 8 weeks normally, but adverse conditions might considerably retard it.'

Examination of the adult shows that this is without doubt an undescribed species, and the genus also is apparently new to science. Its affinities are somewhat uncertain, for the sacral diapophyses afford only obscure indication of its family; on this character, it might reasonably be referred either to the Ranidae, or to the Engystomatidae as at present defined. However the sternum strongly suggests relationship to the genus *Cacosternum* Blgr., which is peculiar to S. Africa, and has been regarded of late years as belonging to Engystomatidae. But, *Cacosternum* has the sacral diapophyses strongly enlarged, as is typically the case in this family, whilst in the present genus they are scarcely enlarged, being subcylindrical and slender in the basal half, but broadening out somewhat at the apex. As in *Cacosternum*, the upper jaw is toothed, whereas all other Engystomatidae are devoid of such teeth: this is the only character utilised by Boulenger, in his paper entitled 'Revised List of S. African Reptiles and Batrachians',* for separating the families Ranidae and Engystomatidae, the former being toothed and the latter toothless. If the presence or absence of maxillary teeth is really of family importance,

*Annals South African Museum vol. V, p. 524.



Text fig.—*Anhydrophryne rattrayi* sp. nov.

1. Head of late embryo in side view. 2. Late embryo. 3 and 4. Terminal phalanges on toe of adult.
h=forelimb hidden under the skin. *i*=fold of intestine. *l*=sharp horny lower lip.
n=terminal portion of notochord. *u*=hooklike projection on edge of upper jaw.

these two genera must therefore be placed elsewhere, but they present important points of difference from any of the Ranid genera—for instance, the absence of the precoracoids—and apparently agree most closely with the Malagasy genera for which the family Dyscophidae was constituted, and which according to Gadow is best regarded as a subfamily of the Engystomatidae.

Again, the pectoral girdle of the toothed genera Anhydrophryne and Cacosternum very closely resembles that of the toothless Engystomatid genus Phrynomantis, but this has greatly enlarged sacral diapophyses, like Cacosternum.

In his important general monograph of the Batrachia Salientia, the only cranial character mentioned by Boulenger is the fronto-parietal fontanelle. This is said to be absent in all genera belonging to the families Ranidae, Dyscophidae and Engystomatidae: it is present in various arciferous genera (Bufonidae, Cystignathidae etc.), but the character seems to be hardly of generic importance and is evidently not a reliable guide to the family. It is accordingly of no great significance that the fronto-parietal fontanelle proves to be absent in Anhydrophryne, but present in Cacosternum. In the latter genus the fontanelle is very large, the two fronto-parietals being widely separated from each other for the whole of their length. The presence of such a fontanelle in an Engystomatid genus was made known many years ago through Peter's work in the 'Reise nach Mossambique,' where the skull of *Breviceps mossambicus* is figured, showing the fronto-parietals much as in Cacosternum: it is noteworthy that the related genus Hemisus is without the fontanelle.

From the above mentioned facts it will be understood that the supposed relationship between Phrynomantis, Cacosternum, and Anhydrophryne, is an inference based solely on the characters of the pectoral girdle, due allowance being made for the fact that these three genera are South African, the two latter being peculiar to the subcontinent.

The important characters of the new genus are as follows:—firmisternous; sacral diapophyses only enlarged near the apex;

upper jaw toothed; pupil horizontal; tongue attached only in front, more or less heart-shaped, being bifid behind but not deeply so; vomerine teeth absent, and palate without dermal ridges; tympanum distinct; fingers and toes free, their tips blunt and not dilated, terminal phalanges more or less anchor-shaped, no intercalary phalangeal bone; outer metatarsals united; sternum bony, short but strong; precoracoids absent, coracoids stout, omosternum absent; mouth large; subarticular tubercles of fingers and toes almost entirely absent: fronto-parietal bones in contact mesially throughout their length.

Thus, the characters in which *Anhydrophryne* differs from *Cacosternum* are:—sacral diapophyses: presence of tympanum: sternum shorter but stouter: absence of subarticular tubercles on the digits: anchor-shaped terminal phalanges: fronto-parietal fontanelle. In *Cacosternum*, the sternum is a little longer than the expanded ventral end of the coracoid, whereas *Anhydrophryne* has the sternum scarcely more than three-fifths as long as the greatly expanded ventral end of the coracoid.

The specific characters of *Anhydrophryne rattrayi* are as follows:—General habit a little depressed; hind limbs of moderate length, when pressed forwards along the body the tibio-tarsal articulation reaches the tympanum, and the tarso-metatarsal articulation almost to the nostril (smaller example), or tarso-metatarsal joint only reaching to the eye (adult female example); first finger only a trifle shorter than the second, which is subequal to the fourth in length; third toe only very slightly longer than the fifth; a single small metatarsal tubercle; skin quite smooth throughout (except for some quite weak granulation on the chin region of a small sub-adult female); tympanum about two-thirds the diameter of the eye; nostril just below the ill-defined canthus rostralis, and a little nearer to the eye than to the tip of the snout; eye of moderate size; interorbital space broader than upper eyelid; in the aforementioned subadult female, the snout projects forwards somewhat in advance of the lower jaw, as in many burrowing

reptiles, and the rostrum is whitish: in the adult female, the snout does not project forwards, nor is it white, and seen from above is rounded, rather than acute. The ventral colouration is very distinctive, the belly being marbled with a coarse dark meshwork on a white ground: chin and throat only faintly marbled, almost uniformly ashy or dark, the lower lip with white spots: upper surface dark, two darker cross bands on the tibia, and weaker ones on the femur and tarsus: a darker band on each side of the head, passing backwards from the eye through the tympanum to the base of the forelimb, and forwards from the eye to the tip of snout, the hinder portion of this band being edged below by a thin curved white streak, and there are traces of a similar pale edge above. One example (in spirits) has a coppery red tinge throughout the upper surface. Measurements of largest specimen, an adult female: length from snout to vent, 23 mm., free portion of longest toe 6 mm., length of foot measured from tibio-tarsal joint to end of longest toe, 15 mm., breadth at gape, 8.5, interorbital breadth 2.9.

Material is not at present available for a description of the earlier stages of development. The eggs are large unpigmented vitelline spheres, yellow throughout, measuring about 2.5 mm. in diameter. The single embryo received has a tail more than $1\frac{1}{2}$ times as long as the body, fairly well developed hind-limbs, and developed fore-limbs hidden under the skin. The tail is fairly thick and without a swimming membrane, though a thick marginal fringe occurs over the whole length: for the greater part of its length it is devoid of pigment: about 18 myotomes can be seen, but towards the apex the notochord is not covered by muscle. The abdomen is yellow from the abundance of yolk, and the intestine is not visible except a single coil in front. No trace of a spiracle can be seen, and the vent is not yet perforated. The mouth is quite devoid of labial teeth: there are no fleshy labial papillae: there is no dark coloured horny beak such as occurs in ordinary tadpoles, but the well developed jaws have comparatively sharp cutting edges, especially so along the lower jaw, which seems to be horny although not composed of minute



Anhydropyrne rattrayi sp. nov. Slightly enlarged.



teeth and not pigmented: the upper jaw overlaps the lower one as in a normal tadpole. The eyes are still within the skin, and movable eyelids are not yet indicated. The tail is about 6 mm. long, and the head and body about 4 mm.

Dr. Rattray's discovery is of considerable biological interest. Had this been found in some arid region, it would have been referred to the long category of environmental adaptations; but, the forests of S. Africa retain a more or less permanent supply of water, so that the habit of *Anhydrophyne*, if really secondary, cannot have been imposed thereon in consequence of adverse conditions, unless the creature has subsequently changed its habitat: whether this life history is primitive or secondary may perhaps be ascertained through a detailed study of the earlier stages of development. Abbreviated life histories in Anura are comparatively common, though the larval phase is not often omitted altogether: and, as many features of a typical tadpole are so obviously secondary, some herpetologists no longer regard the tadpole as a primitive element in the cycle of ontogeny. The primitive Anuran would have a long-tailed embryo, but not necessarily a free swimming one, the tail being respiratory in function. As Boulenger has recently asserted, 'the old conception of the frog in its development climbing up its own genealogical tree must be abandoned.' It is remarkable that a toad so completely aquatic as *Pipa americana* should have young which complete their metamorphosis within the egg.

However, *Anhydrophyne rattrayi* is not a primitive Anuran in respect to its adult structure: the simplicity of the pectoral girdle is without doubt secondary.

A NEW ADAPTIVE CALLOSITY IN THE OSTRICH.

BY PROF. J. E. DUERDEN, M.Sc., Ph.D.,

Professor of Zoology, Rhodes University College, Grahamstown.

[Plate VI.]

The African ostrich, *Struthio*, is unique among living birds in having only two toes to the foot in place of the four to be found in most birds. During the early stages of its development, however, while still within the shell, three clearly defined toes are present, a large median and a smaller one on each side, the inside one being greatly reduced compared with the outside (Fig.1). Moreover, Dr. R. Broom* has shown that at about the tenth day of incubation hints are to be found of two other toes in the form of vestigial metatarsals; hence at this stage of its development the ostrich bears suggestions of the five toes characteristic of the normal pentadactyle foot. The traces of the fifth however persist for a very brief period, probably for only a few days, and those of the first for but a little longer. The second toe continues for nearly the whole period prior to hatching, but no evidence of it remains in the newly hatched chick; its supporting metatarsus however persists throughout life, as a small projection at its distal end but as an essential constituent of the trifid proximal end of the tarso-metatarsus. Hence when we say that the ostrich has only two toes to its foot a time qualification is involved; for at a certain stage in its development it has three toes, and hints of four and five.

It is manifest therefore that the modern, two-toed ostrich is degenerate as regards the small number of its toes, traces of the others still persisting within the embryo and strongly suggesting that its ancestors were provided with three and four complete toes and, at a very remote period, with even five.

* "On the early development of the Appendicular Skeleton of the Ostrich, with remarks on the Origin of Birds," Trans. S.A. Philos. Soc., Vol. XVI, 1906.

There is every likelihood that four toes were at one time functional as in most living birds, while evidence will be presented showing that three toes were in use for a long period of its history, the African ostrich then resembling the American three-toed ostrich, the Rhea. Degeneration has presumably been brought about by the gradual loss of the germinal factors concerned in the production of the toes, but the loss is not altogether complete.

Probably some mechanical advantage in running has accrued to the ostrich in the loss of three of its toes, though the connection between this and the retrogressive process may be altogether incidental. In the course of evolution characters are held to appear and disappear quite apart from considerations concerned with the welfare of the organism. Evidence is afforded that the small, outer fourth toe is undergoing retrogression at the present time, particularly as regards its reduction in size, loss of scales and claw. When it ultimately disappears there will remain only the third middle toe, a like condition to that represented in the modern horse, where the single toe is associated with great speed in running. The scales are however beginning to disappear from the third toe, and the loss is interpreted as the first sign of its degeneration, which will evidently proceed on lines similar to those effecting the reduction of the fourth toe. It follows therefore that if nature were allowed its free, unrestricted course the ostrich would in time lose its outer small toe, and afterwards the large and only one remaining; though we cannot conceive of the bird surviving such losses.

When half crouching the ostrich, as shown in Fig. 2, rests upon the tip of its partly bent toes and upon the ankle end of the tarso-metatarsus. The under surface of the toes is covered with a greatly thickened pad or callosity formed of long, narrow, villous projections, each one corresponding with a scale, but so compact that they give the appearance of a coarse pile of velvet, an arrangement singularly well suited for gripping the sandy areas over which the bird often roams. The skin over the middle part of the ankle is also strongly callous, but the constituent elements are broader and shorter

than those of the toes (Fig. 3). The formation of the callosities can readily be understood as responses of the skin to pressure and friction against the hard ground during the ordinary activities of the bird in running, walking and crouching, just as they form on the sole of the human foot in walking bare-foot, and on the palm of the hand engaged in manual labour. As a matter of fact, however, it is found that the callosities on the toes and ankle occur on chicks before hatching, that is, long before the parts can have been subject to any pressure and friction (Fig. 3). The ostrich has therefore definite structural features, callous pads, which are hereditary, but whose formation could just as certainly be accounted for from the known activities of the bird and the responsive nature of its skin. Exactly similar characters can be produced by two wholly different methods: (*a*) germinally, that is, from genetic factors in the germ cells, and (*b*) adaptively, as a result of pressure and friction upon the skin from the chick stage onwards. Characters which are hereditary could also be acquired in the course of the life-time.

Considerations like the above lead to the conclusion that the hereditary callosities are really the same as those which would be produced during the life-time of the ostrich. It is suggested that in the past the latter have become so impressed upon the structural constitution of the ostrich that they have become transmissible, and now appear without the original stimuli of pressure and friction: in other words, characters acquired during the life-time of the individual as a result of its activities and the responsive nature of the skin have become hereditary. The highly contentious subject of the transmission of acquired characters, particularly as regards the callosities on the sternum and pubis of the ostrich, has been further elaborated in a paper appearing elsewhere.

For the sake of simplicity it has been assumed that the crouching ostrich rests upon the middle part of the ankle end of the tarsus, the covering skin of which bears the hereditary callosity. This is however scarcely the case. The ankle does not rest squarely upon the ground, but is tilted inwards so that it supports the body somewhat below and on its inner side,

instead of at the end and middle. This can easily be seen or felt when the bird is either half or completely crouching. At the place where it is in contact with the ground a new thickened pad appears a little to the inside of the original one, though the two are continuous. It begins to form at the early chick stage and becomes larger and coarser with age (Figs. 4 and 5). Thus at the ankle joint the ostrich in crouching does not make use of the pad provided at birth, but forms a new one as an adaptation to the new position assumed by the tarsus. The bird bears a hereditary median callosity which is now non-functional, and acquires an accessory pad which is the actual one in use.

The interpretation of this unexpected relationship is fairly simple if we recall the retrogressive changes which have taken place in the number of digits to the foot. In the course of its evolution the ancestral ostrich must for a long period have had three functional toes, the second, third and fourth, in place of only the third and fourth of to-day, and the disproportion in size was probably less than between the present two. If, when crouching, the bird rested in front upon these three bent toes the other end of the tarsus would also rest squarely upon its middle part, the median toe being steadied distally by one on each side. The ankle callosity formed under these conditions would be exactly in the position in which we find the hereditary one; it would be included in the same axial plane as the big middle toe, and serve as the functional thickening of the three-toed stage.

When in the course of the retrogressive changes which have taken place in the foot of the ostrich the inner, second toe disappeared the crouching bird would then have for support in front only the third and fourth digits. Unsupported by the inner, second toe the former equilibrium would be disturbed, and the weight of the bird would cause the tarsus to tilt inwardly a little and come to rest upon a new support. Over this a thickened pad would form as a result of the pressure and friction to which the skin would be subject. On the crouching bird it is readily seen that the ankle support is no longer along the middle of the tarsus but somewhat to the

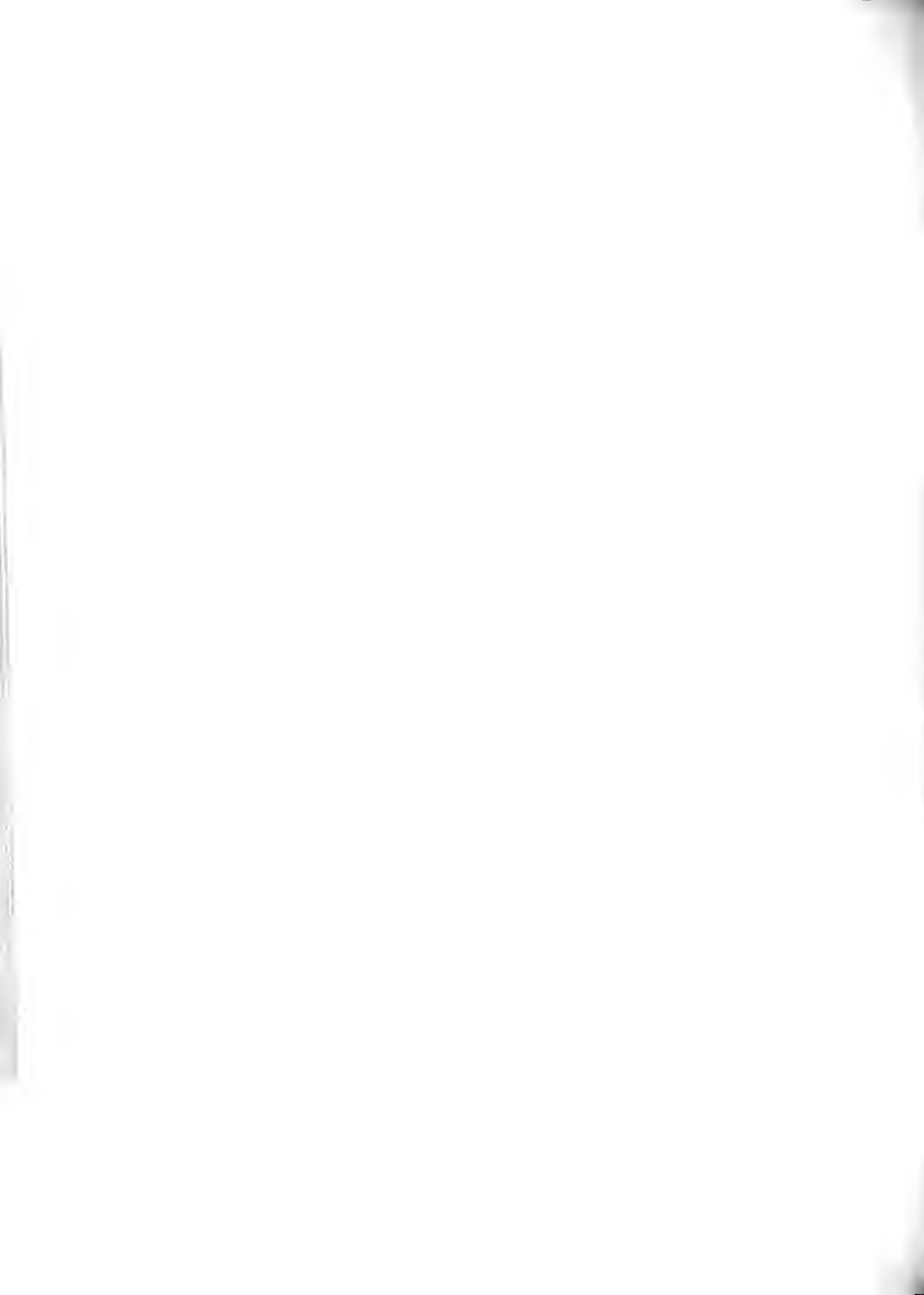
inside. From the young chick onwards the median hereditary callosity is barely used, if at all, though it persists throughout life, while the accessory one begins to form within the first week or two after hatching. The old, non-functional, hereditary callosity is therefore a structure reminiscent of the period when the ostrich rested upon three toes, while the functional accessory pad is a recently acquired adaptation to meet the new relationships resulting from the loss of the second toe. No trace of the accessory callosity occurs on the chick before or on hatching: it has to be formed wholly anew with each generation. The median on the other hand appears in its full development at and before the time of hatching and, though non-functional and useless, persists throughout the life-time of the bird.

If the median callosity was originally acquired as a result of the bird resting upon this part of the ankle and, as we have assumed, afterwards became transmissible, the question may well be asked why the accessory callosity has in like manner not become hereditary, but has to be formed anew with each generation. In reply it may be said that we are yet altogether ignorant as to the means by which an acquired adaptive character can become transmissible, and in the opinion of the majority of biologists no certain evidence has been adduced that it ever actually takes place. The arguments in support of the acquired transmissibility of the callosities in the ostrich depend upon the thesis that if they are not adaptive structures which have now become hereditary then the same character can be produced in two wholly distinct ways: (*a*) from factorial changes in the germ plasm, and (*b*) from the known activities of the organism and the responsive nature of the skin. Probably no biologist would be disposed to accept this as a possibility, and yet there appears no escape from it unless we are prepared to admit that acquired characters may become transmissible.

As acquired characters are disturbances of the normal structural relationships and occur in the course of the life-time, it is suggested that if continued generation after generation they may ultimately come to replace the old relationships



Adaptive callosity in Ostrich.



altogether, and re-appear without the stimuli which originally called them forth. Their appearance may, as it were, become accelerated and they arise in the chick before hatching, without necessarily becoming germinal in the sense of having factorial representation. It is also suggested that in the early days of the establishment of a species the various structures were more responsive to the transmission of results from stimuli than later. In many respects the ostrich appears to have reached senility, and it may be that structural changes resulting from external stimuli are now more likely to remain transient, instead of becoming impressed permanently upon the organism. This may assist in some measure in understanding why the later accessory ankle callosity has not become hereditary, and also why the median callosity, though unused, continues to appear generation after generation.

EXPLANATION OF PLATE.

- Fig. 1.* Tarsus and foot of ostrich chick after about 14 days' incubation, showing three toes. The longest middle toe is the third and that to the right is the fourth; the one on the left is the second and appears as only a slight projection.
- Fig. 2.* Group of chicks, the one in the fore-ground seen in a half crouching attitude. The weight of the body is supported upon the inside of the ankle and the partly up-turned two toes. When fully crouching the bird lurches forwards and comes to rest upon the sternal and pubic callosities, the tarsus and toes remaining in the same position.
- Fig. 3.* Callosities on foot and ankle of chick a few days before hatching. The thickenings are already well developed, the separate elevations on the toes being much narrower and closer than those on the ankle.
- Fig. 4.* Ankle region of young bird showing the symmetrical hereditary callosity above and the accessory one forming below on the inside (to the left).
- Fig. 5.* Ankle region of old bird in which the accessory ankle callosity (on the right) has become rough and broken up.

**Descriptions of New South African Spiders and a Solifuge of
the genus *Chelypus*.**

BY JOHN HEWITT.

Fam. ARCHAEIDAE.

ARCHAEA GODFREYI sp. nov. (Text figs. 1 and 2.)

This species is founded on a series of specimens, including one adult male, taken at Somerville near Tsolo, C.P., by the Revd. Robt. Godfrey, who kindly presented the material to the Albany Museum.

Apparently, only one other living species has been described, viz., *A. workmanni* Cambr. from Madagascar (see Proc. Zool. Soc. London, 1881, p. 767, Pl. LXVI, fig. 2 a-f; also Simon in Histoire Nat. des Araignées, vol. 1, p. 935, figs. 32, 1005 and 1006). The Somerville species is markedly different from *workmanni* in its stouter habit, the latter species having the chelicerae longer, the head region carried upwards on a narrow neck, and the abdomen conically elevated. In the form of the carapace and abdomen, *godfreyi* has more resemblance to the extinct European species *pougneti* Sim.

The occurrence of this genus in Africa has not been previously recorded, so far as I can ascertain. The living representatives of the family are only known from southern lands, viz., *Archaea* in Madagascar and S. Africa, and *Mecysmauchenius** in the southern parts of S. America. The genus *Archaea* was originally based on some fossilised spiders found in amber from the Baltic and thus of Oligocene age.

* The records of the Archaeid genera have been somewhat confused owing to the great resemblance between these genera and the males of certain Argiopid spiders. Some time ago, Mr. H. R. Hogg informed me that he had seen specimens of *Mecysmauchenius* from New Zealand, a record of considerable interest. However, it is not included in the recent monograph on 'Araignées de Nouvelle-Zélande' (Ann. Soc. ent. France LXXXVI, p. 317-420) by M. le Comte de Dalmas, and as suggested to me by the author *in lit.*, the record may possibly be based on the male of *Landana lautiuscula* Dalmas, of which only the female is described.

Carapace. The form is shown on the accompanying figures. The height at the head region is almost $1\frac{1}{2}$ times the whole basal length. Surfaces rounded, ornamented with small flattened granular tubercles arranged along more or less definite lines which form an open reticulation in the basal half of the carapace. From each such tubercle there arises a short thick decumbent glistening white hair.

Around the crown of the head, 3 pairs of spines are placed; the posterior one is strongest, arising from a small tubercle: the weakest is that situated immediately posterior to the interval between the two pairs of eyes on each side.

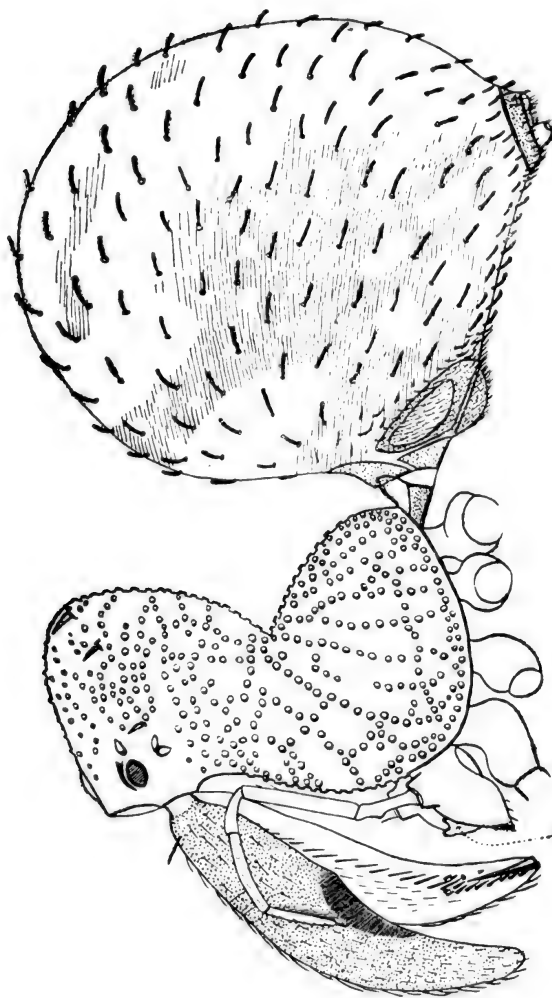
Eyes. Anterior medians large and dark, raised somewhat on the mesial side, directed obliquely outwards. The other eyes are all small and pale, the connate laterals slightly raised on an ill-defined tubercle, the postero-medians level with the surface of the head. The interval between the laterals and the anteromedian is equal to, or rather greater than, the long diameter of the latter.

Labium. This is subtriangular in outline, slightly constricted along a line near to and parallel with the base: apex distinctly incised. The greater portion of the surface presents a strong spheroidal curvature, and is smooth or nearly so: it bears a number of stiff hairs.

Sternum. The surface has a number of strong granular tubercles each carrying a stiff white hair. The middle portion has a convex curvature ending posteriorly in a small pointed projection beset with hairs. Lateral margins strongly sinuated in connection with the insertions of the coxae. Front margin almost straight: hind margin truncate posteriorly.

The *Epimerites* are united into a continuous strip, which along its upper margin is in contact with the inferior edge of the carapace on each side, whilst the lower margin is strongly sinuated in correspondence with the sternum, and thus leaving well defined circular spaces for the insertion of the coxae.

Rostrum. Viewed from in front, the rostrum presents a fairly large pale coloured triangular termination between the converging maxillae: ventrally, the apex of this triangle reaches almost to the maxillary scopula: dorsally, are two



Text fig. 1. *Archiaca godfreyi* sp. nov. Female in side view. Enlarged.

r=rostrum.

short chitinous horns which occupy the basal angles of the triangle, these hornlike processes having a thickened integument.

Pedicle. The lower portions are much more strongly chitinised than the upper. As the tergite passes posteriorly, it becomes arched upwards and extends back a little beyond the sternite. Immediately behind the sternum, there is a median more or less **A**-shaped piece: this seems to be one of the epimerites: it may be the same as the 'plagula sternalis postica' of Simon, or metasternum as termed by Wm. Sorensen who regards it as the ventral element of the metathorax. The pedicle proper presents two well chitinised side pieces, and between them ventrally is a more or less quadrangular area less strongly chitinised.

Abdomen. Subglobular. Integument mostly soft, but in places with chitinous thickenings. Basally it is strengthened all round by a shallow chitinous cup composed of 5 pieces, 1 dorsal, 2 ventral and 2 lateral: the dorsal portion is comparatively rather small, the lateral plates are the largest, the posteroventral plate over-lying the genital region has a strong convex curvature.

At the posterior end, also, is a complete chitinous ring surrounding the spinners and the anal tubercle. In addition, there is a great number of small isolated patches or spots of chitin distributed generally over the surface of the skin. The hairs are nearly all very thick and blunt, rather sparsely distributed, being most numerous ventrally: there are many much finer hairs on the scutes at the base of the abdomen, and the hairs on the skin immediately posterior to the hinder ventral plate are also comparatively slender and numerous. The thick hairs are mostly white and glistening, but some are black: examined under high magnification, the surfaces of the hair are seen to be very finely and closely ciliated. No trace of a median tracheal stigma could be found.

Spinnerets. Under a low power of a compound microscope, only 2 pairs are noticeable. The anterior spinners are rather stout but short, composed of 2 segments, the distal one being quite small: the posterior laterals are much smaller, and are

also of 2 segments. Under a moderately high power, a very minute colulus is seen and a pair of rudimentary posteromedian spinners. There is an anal tubercle of moderate size.

Chelicera. Each chelicera is capable of extensive movement upwards and outwards, and thus the two may divaricate widely. The carapace provides a large oval space for the reception of the bases of the chelicerae: ventrally, this space includes a triangular sclerite, strongly keeled along the middle, the sharply pointed apex of which projects a little way between the bases of the chelicerae.

The chelicera is strongly constricted into a pedicle at the base, much like those of the coxae of the legs but longer. The surfaces are regularly rounded: in lateral view, the anterior surface forms a more or less continuous curve, but the hinder surface is sinuated in relation with a very shallow excavation on the outer side where the chitin presents a series of close-set parallel ridges which may be part of a stridulatory apparatus. Towards its distal end, the chelicera is bent backwards. Away from the parallel ridges, the surface of the chelicera is finely granulated throughout, and carries numerous scattered setae: there is one short, but strong, forwardly projecting bristle near the base anteriorly. Mesially, there extends from the base of each chelicera up to the point reached by the tip of the closed fang, a series of stiff bristles gradually increasing in strength and becoming strong spines distally. On the anterior side of the fang groove is another series of spines, about 7 or 8, and where the two series approach there are 5 or 6 other spines, all short and somewhat irregularly arranged. On the posterior side of the fang groove there is no such series of spines, but two widely separated teeth occur, the proximal one being blunt and low though broad at the base. None of the spines is raised on a tubercle.

The fang is short, well curved, fairly stout: the lower margin is finely serrulated.

Pedipalp. The maxillae closely surround the labium, extending in advance thereof for a distance nearly equal to half the length of the labium. Serrula well developed. Dorsally, a short broad subcylindrical process arises from near

the base and bears the palp. The palp is slender and moderately long. Trochanter elongated, with a small rounded tubercle about the middle of its length anteriorly. Femur the longest segment. Tarsus a little shorter than the tibia, with well developed muticous claw. A few setae occur on each segment, the tarsus being rather densely covered with setae many of which are very finely ciliated and some of the ventral ones are more or less flattened and sword shaped. The tibia bears two long sensory hairs.

Legs. First longest, fourth only a trifle shorter, third shortest. Trochanters all pedicled, first considerably largest. The other segments are all more or less cylindrical, except the trochanters which are much shorter than that of the palp.

Femora all elongated, exceeding any of the other segments, slender, first only a little stouter than the others. Femur I constricted at the base posteriorly. The tibiae are longer than the more distal segments, tibia IV slightly exceeding the combined tarsus and metatarsus IV, but tibia I subequal to combined tarsus and metatarsus I. Patella I nearly twice as long as patella IV. Metatarsi longer than the tarsi. Legs without spines of any kind. Metatarsus III in its distal half inferiorly has a tuft of stiff setae, each with finely ciliate surfaces, and Metatarsus IV has a smaller tuft distally. On all the segments stiff setae occur arranged along longitudinal lines, but the setae are nowhere densely disposed. In the basal segments, these setae are simple or very minutely serrulate, but on the tarsus and metatarsus they become very finely ciliate, usually along one edge only. Several long outstanding sensory hairs occur on all the tibiae and metatarsi: usually, there are 2 or 3 on the tibia, and 1 at the distal end of the metatarsus. Tarsus with onychium, paired toothed claws, and fairly long unpaired claw: the latter has a sharply pointed basilar tooth, and apically may be finely attenuated. The surfaces of the legs and palps, more especially of the femora, are very finely roughened: under moderately high magnification, this has the appearance of minute scales, triangular or polygonal and slightly imbricating: on femur I the surface is more distinctly granulated.

Male palp. Except for a short inconspicuous chitinous hook-like process at the apex of the tibia on its inner side, there are no appendages to the segments of the palp: the trochanter has a faint anterior protuberance as in female. The tarsus has no external branch. The bulbal organ is large, a conspicuous portion, which I suppose is the bulb itself, taking the form of a chitinous capsule which is very broad basally but distally is folded into a more or less bell-shaped termination with widely open mouth.

The tarsus is hairy as usual, all the hairs being distinctly ciliated or serrulate along one edge.

The other male characters agree with those of the female in most respects, but the chelicera of the male presents a characteristic triangular projection on the anterior side mesially, near to the tip of the infolded fang.

Colour. Carapace and chelicerae reddish brown, with whitish setae: legs and palps pale olive brown: the abdomen has a pale yellow ground colour with black markings thereon: the black markings originate as a series of cross stripes which on the sides of the body fuse more or less completely.

Measurements. Total length 3 mm., length of chelicera 1.55, height of carapace 1.6, length of femur of first leg 1.6, greatest breadth of same, at base, .24, least breadth of same, near apex, .13, length of patella of first leg .5, of tibia 1.3, of metatarsus .85, of tarsus together with claw .56.

As reported to me by Mr. Godfrey, this is a very sluggish spider. I have recently found a single specimen under a stone in the damp bush above Fern Kloof, Grahamstown. It was taken along with such creatures as the jumping crustacean *Talitriator africanus* Bate, the molluscs *Apera sexangula* Wats. and *Jaminia ponsonbyana* Morel, the spider *Microstigma geophilum mihi*, and the peripatus *Opisthopatus cinctipes* Purc.: that is to say, it belongs to the association characteristic of our forests.* What seems to be the cocoon of this spider is a loose flimsy structure containing only about six eggs.

* Elsewhere, the above mentioned creatures are not so restricted to forests, although in this immediate neighbourhood they occur only in damp primaeval bush or forest. In the Western Province,

In addition to the remarkable features of structure emphasized by Simon, other peculiarities are exhibited in the species now described. The 'stridulatory' area of the chelicera is not recorded in any other member of the family: this somewhat resembles the stridulatory organ of the genus *Lepthyphantes*, and apparently such an organ is general amongst the Linyphiine group of the Argiopidae. If the area actually subserves a stridulatory function, it seems probable that the other essential portion of the apparatus must be the roughened surface of the femur of the first leg: although no striking modifications are apparent on this segment, its surface is nevertheless more strongly granulated than that of any succeeding femur.

Another feature, most unusual amongst spiders, is the elongated trochanter of the palp. No allusion to this character is made either by O. P. Cambridge or E. Simon: the figure given by the latter author to illustrate the structure of *A. pougneti*, shows no trace of a trochanter, although it was evidently intended to depict the essential features of the palp. In reference to that figure, it may also be pointed out that the horizontal position of the chelicerae is not peculiar to the species as the author seems to suggest in his account.

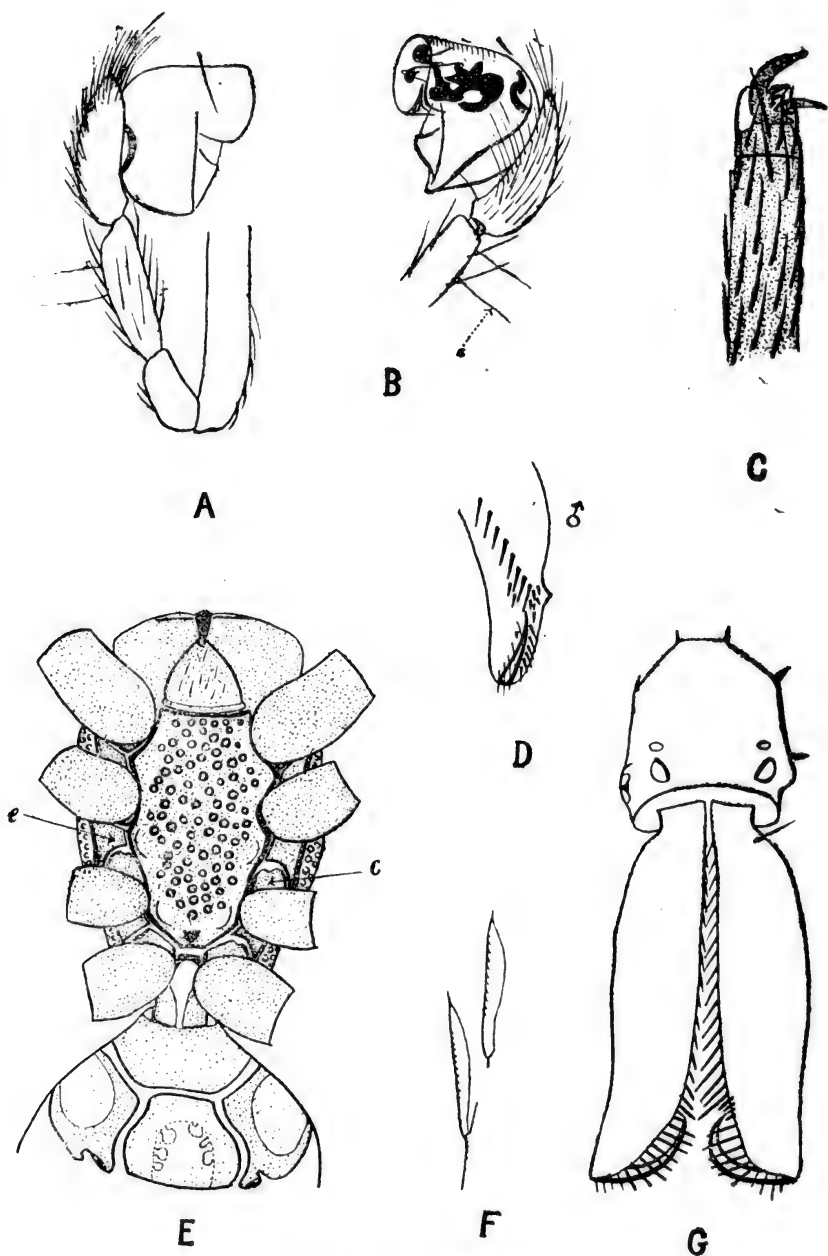
M. Simon found in *Mecysmauchenius* some indication of the median tracheal stigma but it seems to be absent in *Archaea godfreyi*.

Fam. AVICULARIIDAE.

ACANTHODON (*GORGYRELLA*) *HIRSCHHORN* sp. nov.

The type, and the only known specimen, is an adult female example in the collection of the McGregor Museum, collected at Salisbury, S. Rhodesia, by Mr. F. Hirschhorn, as well as in ocular characters. It is a very distinct species,

according to Mr. K. H. Barnard, *Talitriator* is by no means a forest dweller, for the damp places it frequents have long since lost their forest covering, if such ever existed there. At Alicedale too, according to Mr. Cruden, the same creature lives far from forest, and *Opisthopatus* even extends into more or less open country, being found under stones in damp places.



Text fig. 2. *Archaea godfreyi* sp. nov.

A and B Palp of adult male. C Distal portion of third leg of female. D Distal portion of chelicera of adult male. E Ventral view of fore part of body of female. F Gladiate hairs on tarsus of female palp. G Front view of chelicerae, with head of female, the latter being seen obliquely.

s=sensory hairs. c=coxa. e=epimerite.

It is related to *A. schreineri* Purcell, differing therefrom especially in the spinulation of the coxae and of the sternum,

Labium with 12 denticles. The sternum is armed with stout spinules and short spines at the sides, except near the fourth coxae.

Coxa III with a continuous U-shaped strip of spinules extending along the infero-anterior margin, the infero-posterior margin, and along the base inferiorly: the arms of the U do not extend to the distal edge of the segment, posteriorly only half way along the segment. Coxa II with a strip of spinules extending the whole length of the segment antero-inferiorly: a few occur at the base of the segment, but practically none on the postero-inferior edge. Coxa I with numerous strong spinules on the anterior side. Coxa IV with several weak spinules on its anterior side.

Ocular area short, its length slightly more than one quarter the distance between margin of carapace and centre of fovea. Quadrangle formed by frontal and anterior median eyes somewhat broader in front than behind, frontal eyes about $1\frac{1}{3}$ - $1\frac{1}{2}$ diameters apart. Distance between posterior medians about $1\frac{1}{3}$ times the distance between posterior median and posterior lateral.

Chelicera with two rows of strong teeth, 5 in each row. The outer row does not extend to the distal end of the fang groove, and the three distal teeth thereof are much smaller than the two basal ones. Measurements: Length of carapace 12, breadth of carapace 10.4.

The dentition is noteworthy: it resembles *Idiops* in possessing two well developed rows of teeth but differs essentially therefrom in that the two basal teeth of the outer row are considerably larger than the distal ones. In all other known species of the subgenus *Gorgyrella* those distal teeth are quite absent.

IDIOPS PULLOIDES sp. nov. (Text fig. 3. b and c.) The type is an adult male in the collection of the McGregor Museum, Kimberley, taken at Molepolole by Mr. Knobel,

It is closely related to *I. pullus* Tucker (Annals S. Af. Mus. XVII, p. 88, fig. 2) the type of which came from 'region west of Mafeking and north of Vryburg.' It differs from *pullus* as follows:—

The excavation on the outer side of the tibia of the palp has well marked short spines or spinules in its distal half: including those distal to the excavation there are about 12 such spinules. On the inner side of this segment there is a strong spine at the distal end ventrally situated.

Metatarsus I slightly curved in the middle, the distal half being bent downwards: it has 12 or 13 spines on the anterior side, and 9 or 10 on the posterior side. On the anterior side of patella IV, spinules only occur in the basal half. The spurs of tibia I seem to be like those described in *pullus*, but the black distal spur is continuous in its outline with the reddish brown tubercle which bears it.

Tarsus I with numerous subspiniiform setae mesially below. A large entire scopula on tarsus IV, and that of II is entire for the greater portion of its length. Anterior median eyes (clear areas) about $1\frac{1}{3}$ diameters apart: the quadrangle formed by the frontal and anterior median eyes is broader behind.

The surface of the carapace is nowhere truly granular, but short stiff setae arranged in patches occur, as usual. The chelicerae have 6 or 7 teeth of unequal size in each row. The general colour above is dark castaneous, the distal segments of legs and palp reddish. Measurements: carapace 7.1 mm. long, first leg 29.25.

GALEOSOMA PILOSUM Hwtt. (Annals Transvaal Mus. Vol. V, p. 190, Pl. XXVI, figs. 5, 6 and 7.) The adult male of this species was dug out from a nest found in Pretoria during October 1917 by Master Wager, who presented the specimen to the Transvaal Museum. It is of interest as the first male of the genus yet recorded. In general appearance, it resembles the male of a small species of *Acanthodon*. The characters are as follows:—

Carapace. The surface bears short stiff setae mostly arranged along radiating lines, and apart from the setigerous

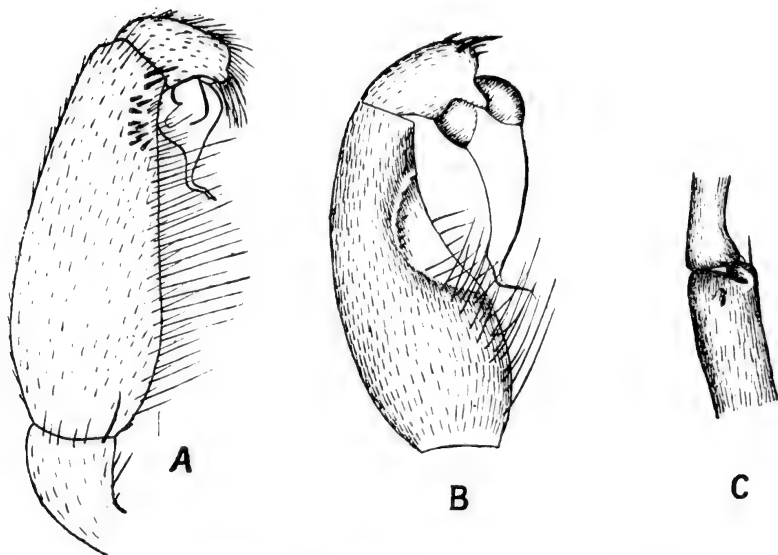
pits is quite smooth. The anterior margin is transverse. Ocular area occupying about one-third of the distance from the anterior margin to the fovea. Quadrangle formed by the eyes of the anterior row considerably broader behind, the antero-medians being larger than the frontals. Postero-median eyes about 2 diameters apart, but only a diameter or less distant from the posterolaterals.

Labium muticous. *Sternum* with 2 pairs of sigilla, the first small, inconspicuous and marginal, the second small and marginal.

Chelicerae. There is a single row of 5 small teeth. The cutting edges of the fang are finely serrulate.

Pedipalp. (Text fig. 3a.) The tibia is elongated, being nearly 3 times as long as deep. The excavation on the outer surface distally is obsolete, but there is a semicircular strip of spinules and short spines: the group includes 3 or 4 spines distally and about 11 spinules. The tarsus has several strong bristles distally but no distinct spines. Spine of bulbal organ short, twisted, not drawn out to a very fine point.

Legs. On tarsus I inferiorly are some scattered scopular hairs, especially in the distal half. All the other tarsi are well scopulate, III and IV especially so. No scopulae on any of the metatarsi. Tarsi all without spines. Metatarsus I slender and almost straight, with a strong spine on each side apically: along the length of the segment on each side is a series of strong bristles or weak spines. Tibia I a little longer and thicker than the metatarsus, not incrassated distally, and quite devoid of distal spurs such as occur in the males of *Acanthodon*: there are 2 strong spines at the apex inferiorly, and also 2 or 3 along the inferior surface externally: another strong spine occurs very near to the apex on the inner side: in addition, the inferior and lateral surfaces bear numerous stout setae and bristles. Patella I has 4 slender spines at the apex inferiorly. Metatarsus II has a spine on each side at the apex, and 2 along the lower surface externally. Tibia II has a pair of weak spines at the apex inferiorly, and 3 long weak spines inferiorly on the outer side.



Text fig. 3. A *Galeosoma pilosum* Hwt. Distal portion of male palp.

B *Idiops pulloides* sp. nov. Distal portion of male palp.

C *I. pulloides*. Tibio-metatarsal joint of first leg of male.

Abdomen. This presents an even contour with no raised surfaces whatever, nor is the undeveloped shield marked by distinctive colouration. To the naked eye, the abdomen is quite like that of an *Acanthodon*. Examined under a lens, the area corresponding to the shield of the female is at once recognised: it is sparsely covered with short stiff setae which become larger along the lateral and hind margins, and anteriorly the surface is rather coarsely pitted: there is a pair of small sigilla, somewhat larger than the anterior pits, just behind the middle of the shield area. Away from this area, the abdomen is densely covered with short fine hairs. Laterally, in the immediate neighbourhood of the shield, the hairs are arranged along well defined parallel oblique lines some of which are continued dorsally into transverse lines, situated some little distance in front of the shield area, and separated

therefrom by a narrow strip which is rather densely clothed with unarranged stiff hairs. Ventrally, there is a pair of large crescentic glabrous sigilla placed just in advance of the spinners and lateral thereto. There is a smaller elongated sigillum on each side immediately posterior to the hind lung opening, and a still longer one lateral to the opening of the anterior lung.

Measurements. Total length 8.5, length of carapace 3.5, of metatarsus of first leg 3.2, of tibia of first leg 3.7.

PELMATORYCTER BREVICORNIS sp. nov. The types in the Transvaal Museum are a series of male and female specimens from Venterskroon, S.E. of Potchefstroom, collected by Mr. G. van Dam during March 1917. They were found under the sides of large stones, and the tubes of their retreats were Y-shaped. The species is closely related to *P. nudus* mihi from Pretoria. It differs therefrom in the shorter palp of the male, in the wider separation of the posterior sternal sigilla, and in the fewer teeth.

Male. Carapace and appendages olive brown: abdomen uniformly dull purplish above, pale below and at the sides. Chelicera with 6 teeth (sometimes 5 or 7). Pressed forwards, the palp reaches a point about two-thirds or four-fifths of the distance along the patella of the first leg: the tibia short, the tip of the spine of the bulbal organ reaching back to a point about halfway along the tibia; the femur with two very short horny processes at the apex above, and slightly proximal thereto a single weak protuberance, or occasionally two, is more or less distinctly represented (in one specimen, the right palp has no horny processes or protuberance): maxilla devoid of denticles at the anterobasal corner. All the tarsi, except IV, are scopulate: I and II are distinctly swollen (not so in *nudus*) and without spines. Metatarsi I and II scopulate in the distal half or more: III and IV not scopulate. Tibia I not quite so numerously spined as in *nudus*, the anterior surface bearing generally about 4 spines. Posterior sternal sigilla about $2\frac{1}{2}$ diameters or even more apart and scarcely half a diameter distant from the sternal margin. Abdomen

with a group of about a dozen spines at the base superiorly. The carapace present a fine matt surface, not corrugated.

Total length 10, length of carapace 3.8. It is thus smaller than *nudus*.

Female closely resembling that of *nudus*, but generally with fewer teeth on the fang groove, 6 being the usual number, 7 occasionally. Maxilla usually with a single denticle at the anterobasal corner, but sometimes none. Posterior sternal sigilla fairly large, about $1\frac{1}{2}$ -2 diameters apart and two-thirds of a diameter distant from the sternal margin. The setae on the sternum not quite so strong as in *nudus*. Lateral margins of carapace without the purplish infuscation that occurs in *nudus*. Total length 12.5, length of carapace 4.

Though quite distinguishable, this form may eventually have to rank as a small variety of *nudus*.

MOGGRIDGEA PSEUDOCRUDENI sp. nov. This species is founded on a number of female specimens collected at Alicedale by Mr. F. Cruden. I have hitherto confused the species with its ally *M. crudeni* mihi, which also occurs at Alicedale, but am now satisfied that the two are really distinct forms, as was first suggested by Mr. Cruden from a study of the trap-doors they make. The remarkable nests previously referred to *M. crudeni* actually belong to the species now described: the true *crudeni* has lids of a normal type, whilst *pseudocrudeni* has lids with fimbriated margin.*

Colour: The upper surfaces are mostly pale brown: the carapace presents a pronounced variegated appearance, as the sloping lateral surfaces of the head region are much paler than the mid-dorsal region, and the clypeus is nearly white. In *crudeni*, the carapace is uniformly dark brown and legs also much darker than in *pseudocrudeni*.

Patella of fourth leg: on the anterior surface is a fairly broad strip of spinules and spinuliform setae. The spinules vary in number, but at least 20 are present and often more

* Notes on the habits of a few trap-door spiders found in Alicedale, Cape Province. By F. Cruden. *South African Journal of Science*, July 1916,

(not counting the spinuliform setae): spinules usually extend about half way along the segment, sometimes further. Immediately ventral to this strip at a point about half way along the segment is weak bristle. In *crudeni*, the strip is narrower and is usually without distinct spinules: if actual spinules occur, they are only a few (about 6) at the base of the segment: the bristle below the strip is long and rather conspicuous: it is well separated from the strip by a distance equal to or exceeding the breadth of the latter. *Coxa of third leg* has a group of about 40-50 spinules inferiorly, and in addition there may be one or two scattered spinules on the posterior side of the ventral surface. In *crudeni* they are not quite so numerous (about 20-25 usually, but occasionally as many as 35), and apart from those in the basal cluster there are no spinules on the ventral surfaces. In *pseudocrudeni*, the coxa of the second leg has some scattered spinules on the ventral surface, in addition to the basal cluster: in *crudeni*, there are no scattered spinules on coxa II, apart from the basal cluster.

Ocular area relatively narrow. Its width is usually not quite twice as much as the width of the fovea. In the typical form of *crudeni*, the ocular area is rather wider, being generally quite twice as wide as the fovea or even more. *Anterior margin of carapace* projects forwards mesially forming a distinct obtuse angle. In *crudeni*, the angle is not so pronounced. This is a variable character and only applicable in the case of full-grown specimens. It may be mentioned that the short mesial prolongation of the fovea posteriorly is a constant feature of this species, but is either present or absent in *crudeni*.

Measurements. Total length 15, length of carapace 5.8, breadth of carapace 4.9.

There is usually no difficulty in distinguishing specimens of the two species, but a single example taken at Alicedale in a nest with lid of simple type presents certain intermediate characters. The colour is like that of *pseudocrudeni*: patella IV is intermediate in the number of spinules, and has a conspicuous bristle fairly well separated therefrom: coxae II and III are spinulated as in *crudeni* but have several scattered

weak spinules away from the basal cluster: the carapace has a well marked angular projection in front. I suspect this to be a hybrid.

The species here distinguished is closely related to another Alicedale species, *M. terrestris* mihi: the latter has no spinules on the ventral surface of coxa I, and the group on coxa III is accompanied by a number of scattered spinules along the posterior portion of the ventral surface.

Moggridgea pseudocrudeni also occurs at the farm Bushman's River, near Dassie Klip, whence it was previously recorded by me, but incorrectly, as *crudeni*. (*Records Albany Mus.* II, p. 456.)

MOGGRIDGEA CRUDENI Hwtt. The typical form of this species occurs at Alicedale, and a dark variety is known to me from Pt. Alfred where it lives amongst the rocks on the west side of the Bathurst Rd., below the native location. The Pt. Alfred specimens have the abdomen very darkly pigmented with well marked cross stripes: in Alicedale examples the abdomen is much paler, but shows whitish cross stripes more or less distinctly. The backward mesial prolongation of the fovea is usually obsolete in Pt. Alfred specimens.

Male from Alicedale.

The more important characters of the adult male are as follows:—Coxae of legs with spinules as in female: labium with 10 dentiform spinules, about half of which are fairly strong: coxa of palp with a few scattered spinules: all the tarsi have divided scopulae, also metatarsus IV: the first two tarsi are distinctly swollen: the tibia and metatarsus of the first leg with strong spines on both sides, and at the base of the tibia there is a single spine on the ventral surface: patella I with 2 distal spines, one on the inferior surface and one lateral: leg II is similarly but more weakly spined, the segments being more slender than those of I, especially the tibia: the spines of metatarsus II are nearly all setiform: on the lower surface of patellae I, and II, is the oblique row of slender outstanding pointed setae peculiar to the genus: legs III and IV without spines: surface of carapace very finely

shagreened except along the depression separating head from thorax: head region well raised, and towards the fovea becoming well marked off from the thorax, the sloping sides for a considerable distance between the fovea and the ocular region presenting basally a sharp cut vertical surface which however is only shallow: the clypeus, about as high as twice the diameter of an anteromedian eye, is also nearly vertical but not sharply cut: anterolateral angles of carapace fairly well marked, obtuse: no distinct mesial furrow between fovea and ocular region: a notable feature in the ocular area is the large size of the posteromedian eyes, which are flat and oblique, with an area very much greater than that of the posterolaterals, and subequal to or even greater than that of any of the anterior eyes. The upper surfaces of carapace and abdomen are blackish, the appendages dark brown. Total length 9, length of carapace 4.3.

It differs from the male of *rupicola* mihi in the spinulation of the coxae, and also in the carapace which is not so depressed in *rupicola*, the clypeus of that species being oblique, and the sides of the head region without basal vertical edge.

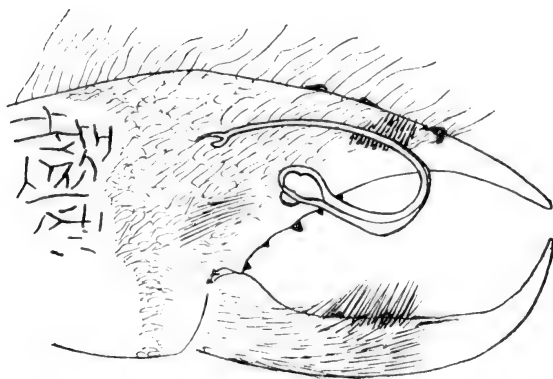
A well marked variety of the species occurs at Woodfields Krantz, near Zuurberg Hotel, Alexandria div. It may be known as *M. crudeni* var. *transversa*. The special feature of this variety is the straight fovea: it is a transverse groove considerably longer than half the breadth of the ocular area, and mesially it presents a well marked but short backward prolongation. On the coxa of the second leg there may be a few scattered spinules distal to the main group. The abdomen is darker than in Alicedale specimens.

The fovea in the typical form of the species is crescentic or more or less **A**-shaped.

Order SOLIFUGAE.

CHELYPUS MACRONYX sp. nov. (Text fig. 4.)

The type is an adult male example in the collection of the British Museum, labelled N.W. Rhodesia (Dr. S. Colyer). It greatly resembles *C. barberi* Purcell, being distinguished therefrom most readily in the length of the tarsal claws of



Text fig. 4. *Chelypus macronyx* sp nov. Left chelicera of male viewed from mesial side.

the second leg. Each claw is approximately equal in length to the peduncle that bears it, the claw adjacent to the row of stout spines being a trifle longer than its peduncle. (Claws of third leg wanting in the specimen.)

Chelicera. Upper surface hairy, and bearing very minute pointed spinules. A small dense patch of short spines on the mesial surface, just posterior to the large black tubercle on the inner side of the upper fang. The two black tubercles of the dorsal surface are small, the distal one rising only slightly above the general surface. An outer row of 5 teeth, the first and fourth very small, the third of moderate size, the others small: they are all well separated. The inner row is represented by 2 denticles situated quite basally: also, the tubercle immediately adjacent to the basal enlargement of the flagellum may perhaps represent an inner tooth but is not black as are all the other teeth. On the mesial surface of the basal portions of the upper jaw there are long silky hairs except over the 'stridulatory' area: along with these is an elongated patch of stiffer hairs representing the stiff bristles in corresponding position on the jaw of a Solpuga, though they are not in a

single row. The dentition of the lower jaw resembles that of *barberi* but the minute intermediate tooth is scarcely visible.

Pedipalp. Upper surfaces of patella and proximal part of tibia minutely shagreened.

Headplate minutely granulated throughout except posteriorly.

Colour. Surfaces generally pale yellow but headplate extensively infuscated over its anterior half. All the granules and spinules on the chelicera and palp are yellow. The longer branch of the bifurcated tip of the flagellum is brown distally.

Total length 35 mm.

This record considerably extends the known range of the genus, for the three previously described species all came from Gordonias and neighbourhood.

**Descriptions of four new South African Land-shells, belonging
to the subfamily Stenogyrinae.**

BY MAJOR M. CONOLLY.

Nine years ago, in a paper in the Annals and Magazine of Natural History, I endeavoured to apply the correct names to those species of South African *Stenogyrinae* which had already been described; and gave new names to a number of forms which could not be included among any of these, though many had long been masquerading as one or other of them. Whether all these new names represent truly distinct species may be, in some cases especially, a little doubtful, but they have at least been found useful as a means of classification, for I have since seen very few forms which, allowing slightly for dimorphism and local variation, cannot readily be assigned a name.

A few new species, however, have gradually come to hand, four of which I now propose to describe. My thanks are due to Mr. Hewitt, Director of the Albany Museum, Grahamstown, for having kindly entrusted two of these to me for publication.

Subulina gracillima sp. nov. 1919 (fig. 1).

Shell small, imperforate, acicular, thin, smooth, shining, transparent; the type is stramineous but fresher specimens would doubtless be pale olivaceous. Spire much produced, acute, apex rounded.

Whorls 9, moderately convex, very gradually increasing, the earlier smooth, remainder covered with close, nearly straight striae which are only perceptible under a strong lens; suture well defined. Aperture small, rounded ovate; outer lip simple, sharp, bowed outwards, not curved forward, but receding at base; columella short, incurved, truncate.

Shell 12×2.5 ; aperture 2.1×1.2 ; length of last whorl 4.8 mm.

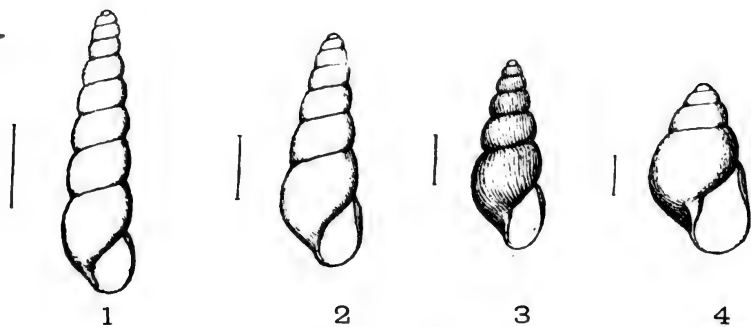


Fig. 1. *Subulina gracillima* sp. nov.
 2. *Opeas albanienne* sp. nov.
 3. *Pseudopeas victoriae* sp. nov.
 4. *Curvella farquhari* sp. nov.

Hab. Rhodesia, South bank of Victoria Falls (Connolly 1910). Type in my collection.

A very distinct little species, whose nearest allies seem to be *S. leia* Putz. from the Congo Territory and *S. pergracilis* Mts. from Bukende, G.E. Africa. It differs from the former in possessing a shorter aperture and half a whorl more in one mm. less length and is only half the diameter of specimens of *leia* kindly furnished me by M. Dautzenberg; while *S. pergracilis* appears to be a slightly larger species with flatter whorls.

Opeas albanienne sp. nov. 1919 (fig. 2).

Shell small, rimate, elongate turritiform, thin, smooth, shining, transparent, pale stramineous olivaceous. Spire produced, acute, sides evenly and gradually tapering, apex rounded.

Whorls $7\frac{1}{2}$, but little convex, gradually increasing, the first two smooth, remainder covered with close, faint, curved striae; suture shallow. Aperture piriform, outer lip simple, sharp, hardly curved outwards, somewhat arcuate forwards and receding a little more towards the base; columella short, margin reflexed.

Shell 9.2×3.1 ; aperture 3.0×1.3 ; last whorl 4.5 mm.

Hab. *Cape Province*, Alicedale (Cruden, 1917), Grahams-town (Farquhar 1916).

Type in Albany Museum.

The only affinity of *O. albanense* is with *O. lepidum* mihi. The type set of the latter were described from a locality reported as well suited for producing the fullest growth of the shell, and the longest shells measured only 7 mm. Good series of the same species from Port Elizabeth show no increase of size. I think, therefore, that the much greater length of the Alicedale shells renders it inadvisable to consider them as even a variety of *lepidum*. In addition to its greater length, the shell is slightly larger throughout, the apex being very slightly broader and each whorl slightly longer than in *lepidum*.

Pseudopeas victoriae sp. nov. 1919 (fig. 3).

Shell small, subimate, elongate, thin, in the type bleached and opaque but normally glossy, transparent, pale greenish olivaceous. Spire somewhat produced, apex acute. Whorls $6\frac{1}{2}$, convex, gradually increasing, the first $1\frac{1}{2}$ or 2 sculptured with microscopic spiral striae, remainder with close, curved, little-raised lirae; in fresher specimens the spiral striation continues, intersecting the lirae for a short distance into the 3rd whorl, where it gradually becomes fainter and disappears. Suture simple, well defined. Aperture piriform, outer lip a little arcuate forward and about equally receding towards the base; columella straight, margin reflexed, forming a narrow rima, which, however, does not appear to be a constant feature in this species.

Shell 7×2.25 ; aperture $1.8 \times .8$; last whorl 3.75 mm.

Hab. *Rhodesia*, Victoria Falls (Connolly, 1910).

Type in my collection.

Four specimens from two different localities, the largest being selected as type. The other three measure 5.5×2.0 , 4.5×1.8 and 3.5×1.75 mm. respectively.

It will be noticed that there is considerable dimorphism in this small series, which may possibly contain two distinct

species, but further material is required before this point can be settled.

When dealing with *Pseudopeas* in Tryon's Manual, Pilsbry conjectured that in this genus the apex, which was described as being smooth, should in reality show microscopic spiral sculpture. His supposition is now confirmed by Commandant Dupuis, who, in conjunction with Dr. Putzeys, has very kindly examined the genotype in the latter's collection and informs me that the embryonic whorls are irregularly but conspicuously, when strongly magnified, spirally sculptured, but the sculpture is faint. The spiral sculpture is intentionally omitted from my text figure as the magnification is not high enough to show it.

Curcella farquhari sp. nov. 1919 (fig. 4).

Shell small, conical, umbilicate, thin, glossy, transparent, pale olivaceous; spire quickly tapering, apex somewhat acute. Whorls 4½, slightly convex, rapidly increasing; the striae, scarcely visible without a lens, are very fine, regular, close, and slightly curved in conformity with the curve of the outer lip. Suture simple, shallow. Aperture nearly oval, peristome simple, sharp; outer lip slightly curved outward and forward, columella slightly curved, margin triangularly reflexed over the umbilicus. Callus none.

Shell 5.6×3.2 , apert. 3.0×1.6 ; last whorl 3.9 mm.

Hab. *Cape Province*. Mountain Drive, Grahamstown (Farquhar 1908, Kincaid 1918).

Type in Albany Museum.

The last whorl is much less globose than that of *C. globosa* M. & P., while the pointed apex distinguishes the new species from *C. elevata* Bnp., which is found in the same locality, and the absence of spiral sculpture from *C. succinea* Bnp. whose shape it somewhat resembles.

I have much pleasure in dedicating this species to Mr. John Farquhar, to whom is due so much of our knowledge of South African Mollusca.

Description of a new species of DICYNODON.

By R. BROOM, D.Sc.

[Plate VII.]

Dicynodon Schwarzi sp. nov. [Pl. VII and Text fig. A].

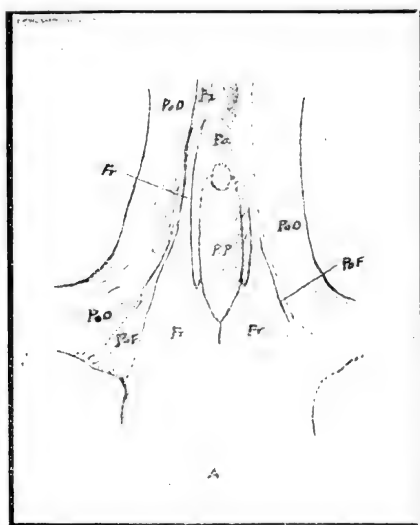
This new species is founded on a very fine large skull discovered by me in 1901 about 12 miles N.W. of Pearston: it is now in the Albany Museum. At that time, *Oudenodon* was not known to be the female of *Dicynodon* and the specimen was referred with considerable hesitation to *Oudenodon Baini* Ow. The type of *O. Baini* is in the British Museum. Though a fairly good skull, it is in such a condition that the sutures cannot be satisfactorily made out, but the general shape and the structure of the parietal region in the two specimens differs so greatly that there is no possibility of the two belonging to the same species; and as this Pearston specimen is unlike any other known type, I have no hesitation in describing it as new, and have much pleasure in naming it after Prof. E. H. L. Schwarz, who amid all his work in Physical Geology has always maintained an interest in Palaeontology.

The specimen is nearly perfect, except for the loss of the posterior parts of each squamosal. The skull is unusually flat, and very broad. Not improbably, the postorbital region is the broadest part of the skull, and in any case it must be nearly as broad as the broadest part of the squamosal region.

The preorbital region is extremely short, and the beak is curved down so that the anterior border is in a plane nearly at right angles to the frontal region. Down the top of the beak is a prominent median ridge. The nostrils are large, and overhung by well marked nasal bosses, and the side view of the beak is not at all unlike that figured in *O. Baini*.

The orbits look mainly upwards. On the inner borders are well developed supra-orbital ridges along the prefrontals and frontals. Behind each orbit is an exceptionally long nearly

straight post-orbital arch, formed by the post-orbital and jugal bones.



Text fig. A. Pre-parietal region in *Dicynodon Schwarzii* Broom.
About $\frac{1}{2}$ nat. size.

The pre-parietal bone is large, and ends in front in the plane of the middle of the postorbital arch. It forms the front border of the pineal foramen and probably part of the sides. The post-frontal bone is tightly wedged in between the frontal and the postorbital, and scarcely shows on the upper surface except perhaps near the orbital margin.

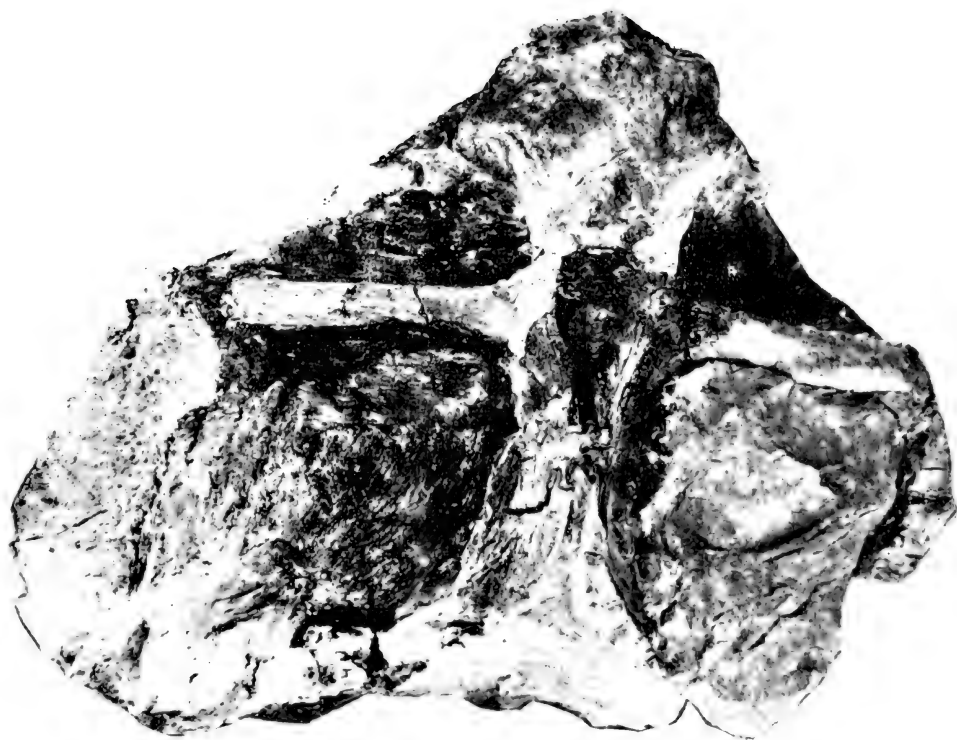
The postorbital is very large. In front, it forms most of the postorbital arch and on passing backwards forms a large inner wall to the temporal fossa. Passing back from the supra-orbital region, the ridges are continued along the posterior spurs of the frontals. These frontal processes pass much further back than in most species, even extending further than the back of the pineal foramen. The ridges are continued

right round the inner temporal fossa margin, and while they are lined on the outside by the thin postorbital they are formed in front mostly by the frontals and behind almost entirely by the parietals. There is a deep groove between the parietals along most of their length.

The occiput, which is broad and much flatter than usual, passes downwards and backwards from the parietal region.

The following are the principal measurements:—

Basal length	...	...	...	250 mm.
(Greatest length (oblique) probably about	...	...	...	280 mm.
Width at back of postorbital arch	...	...	...	232 mm.
Interorbital width	...	...	...	44 mm.
Intertemporal width	...	...	...	40 mm.
Across nasal bosses (middle)	...	...	...	62 mm.
Between caniniform processes about	...	...	...	44 mm.



Skull of *Dicynodon Schwarzii* Broom, in dorsal view. $\times \frac{5}{11}$



On the Genus **COMPHOGNATHUS** and its allies.

By R. BROOM, M.D., D.Sc.

[With Plate VIII.]

In the beginning of 1895, Seeley described a number of *Cynodonts* with broad crowned molars from the Upper Karroo beds of Burghersdorp and Aliwal North, and revealed to the world a new type of tooth structure in the mammal-like reptiles. The forms described were named *Diademodon tetragonus*, *D. brachytiara*, *D. mastacus*, and *D. Browni*. A little later in the same year two other allied forms were described as *Gomphognathus Kannemeyeri* and *Gomphognathus polyphagus*. Another specimen was later described as *Diademodon entomophonus*. In 1911 I described a new form as *Gomphognathus minor*, and in 1913 another new type as *Diademodon platyrhinus*. One other form was described as long ago as 1860 by Owen under the name *Cynochampsia laniaria*, but as this type is only the anterior end of a snout it is for all practicable purposes indeterminable; and Seeley's type of *Diademodon brachytiara*, founded on a simple tooth, may also be considered as indeterminable.

Seeley gave no clear indication of any differences between the genera *Diademodon* and *Gomphognathus*, or of those between the different species, and as a result there has been considerable confusion as to whether a specimen is to be referred to *Diademodon* or *Gomphognathus*.

Having examined all the known specimens, the present attempt to revise the genera may be of some service to later workers.

The genus *Diademodon* is founded on a very imperfect upper jaw with some good molar teeth. As unfortunately both the anterior and posterior ends of the dental series are missing, it is impossible to say how many teeth there were, and as there is further nothing of any value in the specimen except three well preserved molar crowns, the specimen

altogether makes a very unsatisfactory generic type. Though we cannot give the dental formula of *Diademodon tetragonus*, we may be quite certain that the skull must have differed greatly in shape from that of *Gomphognathus Kannemeyeri*, and the few molars that we can compare show differences sufficient to render it highly probable that the two genera are distinct. In any case, it will prevent further confusion to provisionally regard them as distinct.

The genus *Gomphognathus* is founded on a well preserved lower jaw with the back half of the skull in the Albany Museum collection. (Plate VIII, fig. 4, and text fig. 2.) Fortunately, there is in the British Museum a specimen of a nearly perfect skull which can with hardly a doubt be referred to the type species *Gomphognathus Kannemeyeri*. Though the type specimen is fairly well preserved there has been a little doubt as to the dental formula. At first sight, it would appear that there are, as stated by Seeley, 13 postcanine teeth on each side of the type jaw, and of these the first four on each side appear to be premolars. On carefully measuring the teeth, and comparing the two sides, one comes to the conclusion there is something wrong in the idea that there are four premolars and nine molars. On the right side, the 1st premolar is a small tooth situated 8.5 mm. behind the canine; on the left side, is larger tooth which is 11 mm. behind the canine. One is forced to the conclusion that the 1st small premolar is lost from the left side, and this is borne out by the fact that the 10th and 11th teeth of the left side do not agree with the 10th and 11th of the right side, but with the 11th and 12th respectively; and the 12th left tooth manifestly corresponds with the 13th right one. So confident was I that the 13th on the right side could not be the last, that I took the liberty of developing the jaw a little further and discovered a 14th tooth. Thus it is quite manifest that there are 14 teeth on the right side. But in the right-hand series there are clearly four premolariform teeth, and on the left side also manifestly four premolariform teeth, and if the small first premolar is lost from the left side, we must

consider that there are five premolars. How comes it then that the 5th tooth on the right side is molariform? On this point we get some light from the condition of the incisors. There are clearly three incisors on each side, and the roots of each outer two are well preserved. When we carefully examine the 1st incisor, we see on the right side a scrap of the root of a displaced incisor, and the tip of the crown of a successional tooth. On the left side also, there is clearly seen a portion of the root of the deciduous incisor, the tip of the 1st permanent incisor coming through. We thus see that the skull is that of an animal not quite fully mature, and there can I think be no reasonable doubt that the 5th molariform tooth on the right side is really the deciduous 5th premolar, and the 4th tooth on the left side the 5th permanent premolar. The molar crowns are not well preserved. Molars 1, 2, 3, 4, and 5 have rounded crowns, apparently with an outer larger cusp and an inner smaller, and at least on M.5 a small talonid. M.6 is a little longer than broad, and has a large outer cusp and very little of an inner cusp at all. The M.7 is about twice as long as it is broad. There is a very slightly developed inner cusp, but on the whole the tooth much resembles a carnivorous premolar. M.8 is very flat with no inner cusp. M.9 is rudimentary.

Years ago (1905), I called attention to the fact that the difference of the molars in *Gomphognathus* from those in *Cynognathus* was comparable to that between those of the sea-otter *Enhydra* and the common otter *Lutra*. It is merely that in *Gomphognathus* the inner cusp is developed to such a degree that most of the molars are given a broad crown. A further interesting point is that the main cusp of the premolars is apparently homologous with the main or outer cusp of the molars. In a series of molars such as occurs in *Cynognathus* this is manifest. Here in *Gomphognathus*, it is only a little less manifest. In a paper on the dentition of *Chrysochloris*, published in the Annals of the Natal Govt. Museum in 1909, I pointed out that the main reptilian cusp became not the mammalian protocone, but much more probably the outer anterior cusp of the mammalian molar. This seems to be well borne out by the condition in *Gomphognathus*.

In *Gomphognathus Kannemeyeri* the last nine teeth, i.e. the true molar series, measure 53 mm.; the last seven 44; the last five measure 33, and the last three 20 mm. These measurements are the same to a fraction of a mm. in the type and the British Museum specimen.

Gomphognathus polyphagus agrees closely with *G. Kannemeyeri*. The corresponding four molar measurements are 51, 41, 28, and 17—each very slightly less than in *G. Kannemeyeri*. The width of the palate outside the last molar is larger in *G. polyphagus* than in *G. Kannemeyeri*, being 70 mm. as against 54, a quite appreciable difference, yet not greater than is found in the skulls of recent animals of the same species, and it seems not improbable that the difference may be sexual—the shorter broader-jawed form being the female. Certainly, the difference between the two supposed species is so little that I think it probable that *G. polyphagus* is the same species as *G. Kannemeyeri*.

Diademodon mastacus is founded on a very imperfect maxillary region of a skull with six molars, three of which are well preserved. The molar measurements are—last seven 41 mm.; last five 32 mm., and last three 17 mm. It will be seen that these agree so closely with those of *G. Kannemeyeri* and *G. polyphagus* as to make it highly probable that *D. mastacus* is also a synonym of *G. Kannemeyeri*. But as *D. mastacus* was named a few months before *G. Kannemeyeri*, it will be necessary to refer to these three specimens as *Gomphognathus mastacus* (Seeley).

Diademodon Browni is founded on the middle region of a skull with the molars for the most part very imperfectly preserved. The molar measurements are—last seven 38 mm., last five 29, and last three 16 mm. Though these do not differ very greatly from those of *G. mastacus*, there is good reason to believe that *Diademodon Browni* is a good species. *Diademodon entomophonus* is much better preserved, and there can I think be little doubt that it is the same as *Diademodon Browni*, and it is certainly distinct from *G. mastacus*. The molar measurements in the type of *D. entomophonus* are—

last nine 43 mm., last seven 37, last five 29, and last three 17 mm. A marked difference between this species and *G. mastacus* is in the palatal width. In the type of *Gomphognathus Kannemeyeri* the distance between the fourth last molars is 32 mm., and in the type of *G. polyphagus* 34 mm., but in *Diademodon entomophonus* it is only 19 mm. A very fine specimen in the British Museum was described by me as *Gomphognathus minor*, and by Watson later referred to as *Diademodon Browni*. In it the molar measurements are - last nine 41 mm., last seven 35, last five 26, last three 15. The palatal width between the fourth last molars is 23 mm. It thus seems probable that Watson's reference is correct, and that both *Diademodon entomophonus* and *Gomphognathus minor* are synonyms of *Diademodon Browni*, but as the dental formula is pretty manifestly the same as in *Gomphognathus Kannemeyeri* the species will have to be called *Gomphognathus Browni* (Seeley).

Cyclogomphodon platyrhinus (Broom) g. nov.

In 1913 I described under the name *Diademodon platyrhinus* an imperfect skull from Winnaarsbaken in the Burghersdorp dist., C.P., which was of especial interest in showing a clear dental succession in the incisors, canines and premolars. Only the lower jaw was figured, and no measurements given; so that the following additional details will be of use to other workers. The dental formula is apparently P.M.4, M.8. The molars differ from those of *Gomphognathus* in being much rounder, and in the posterior molars being much more molariform. The genus is however closely allied to *Gomphognathus*.

The last seven molars measure 32 mm.; the last five 25 mm., and the last three 15.5 mm. The palatal width between the 4th last molars is 17 mm. The width across the last molars is 45 mm. The 5th last molar (i.e. M.4) measures 5.5×4 mm., and M.5 = $6 \text{ mm.} \times 5 \text{ mm.}$ Depth of lower jaw at M.3 is 19 mm.

In 1905, I described a mandible and some postcranial bones that had been found by Mr. Alfred Brown near Aliwal

North. These I referred to *Diademodon mastacus*. As we now know that *Gomphognathus mastacus* has five premolars and nine molars, whereas this jaw in Mr. Brown's collection has four premolars and only seven molars, it cannot belong to that species. A question arises whether it may not be a young animal which later might have five premolars and nine molars as in *Gomphognathus*, or whether an 8th molar might not appear and give it the dental formula of *Cyclogomphodon*. We may dismiss as hardly possible the addition of more than one undeveloped molar. The first five molars are all worn down, and the first four much worn; so that the animal can hardly be regarded as young. The four premolars are evidently all of the permanent set, and while the tooth regarded as M.1 may be D.P.M.5, it would be impossible to allow for more than one additional molar, and even thus the formula would only be P.M. 5, M.7. Most probably, all the seven molariform teeth are true molars, and the dental formula must be either P.M.4 M.7 or P.M.4 M.8. As however the last molar in all the forms in which the full set is present is small and narrow, we are probably justified in regarding the dental formula as P.M.4 M.8; in which case it would agree with *Cyclogomphodon platyrhinus*. The teeth which we can compare agree sufficiently closely to render it highly probable that the jaw belongs to this genus at least, and as the measurements do not differ more than might be expected in different individuals of the same species, I am inclined to refer Mr. Brown's specimen to *C. platyrhinus*.

The previously described species may be summarised as follows:—

DIADEMODON. Narrow-headed form with rounded upper molars and premolars. Dental formula unknown.

Diademodon tetragonus, Seeley.

GOMPHOGNATHUS. Broad-headed form with most of the upper molars much broader than long, and posterior lower molars flattened. Dental formula $i\frac{1}{3} c\frac{1}{2} pm\frac{5}{2} m\frac{9}{3}$.

Gomphognathus mastacus (Seeley).

Syn. *Gomphognathus Kannemeyeri*, Seeley.

Syn. *Gomphognathus polyphagus*, Seeley.

Gomphognathus Browni (Seeley).

Syn. *Diademodon entomophonus*, Seeley.

Syn. *Gomphognathus minor*, Broom.

CYCLOGOMPHODON. Broad-headed form with rounded molars. Dental formula $i_3^4 c_1^1 pm_4^4 m_3^2$.

Cyclogomphodon platyrhinus (Broom).

Octagomphus Woodi gen. et sp. nov. (Plate VIII, figs 1.3 and text fig. 1.)

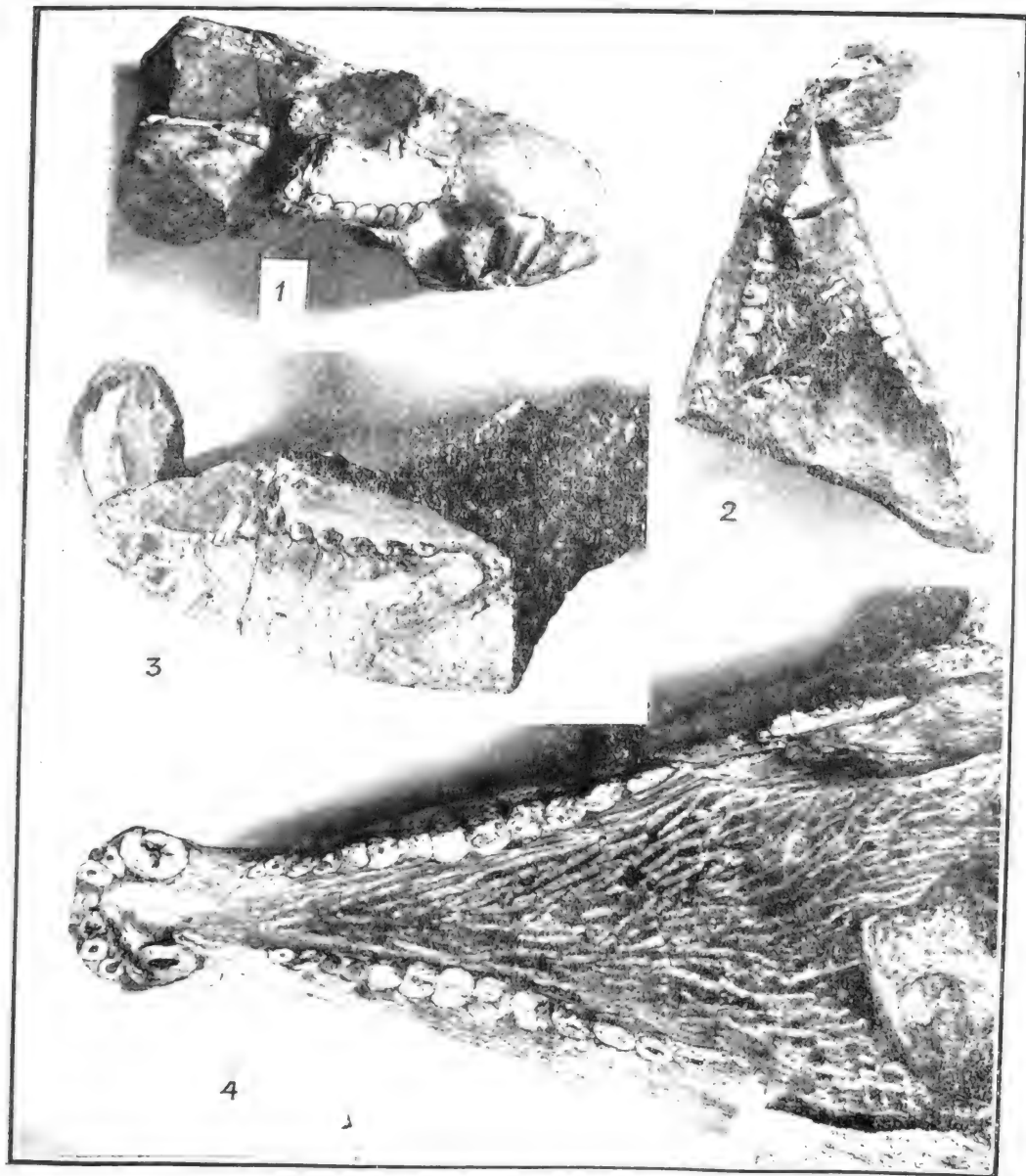
This new genus and species is founded on an imperfect skull in the collection of the Albany Museum: it was collected at Steynsburg by Mr. J. L. Pretorius. It consists of most of the skull in front of the postorbital arch, considerably crushed, and with the greater part of both dentaries. The lower jaw has been displaced, but crushed against the upper jaw. To display the teeth, the two jaws have been separated, but as the matrix is hard and the teeth brittle it has been found impossible to completely preserve the crowns.

The snout in general structure agrees pretty closely with that of *Gomphognathus mastacus*. The inter-nasal process of the premaxilla is lost, but so far as the premaxilla is preserved it does not present any striking difference from that of the well-known type. A few incisors are preserved, and those are laterally compressed pointed teeth with a posterior edge which appears to be unserrated. The number of incisors cannot be made out, but is most probably as in *Gomphognathus*, four above and three below. A small portion of the septo-maxillary is preserved, and is similar to that in *Gomphognathus*.

The nasal is a long bone, very narrow in front and moderately wide behind. Laterally it articulates with the septo-maxilla and the maxilla, and posteriorly with the lacrymal, the prefrontal, and the frontal. The lacrymal, the prefrontal, and the frontal are all very similar to those of *Gomphognathus*, though in this new form the prefrontal

together occupying 10 mm. The second tooth has a crown 4.5 mm. high and 2.7 mm. in length. The succeeding five teeth have all rounded crowns. Each has a low outer cusp and less developed inner one, with a very low ridge connecting the two. Round the inner border are two or three still smaller cusps. On passing thence backwards, the molars are found each to develop more and more a posterior cusp, which becomes a sort of talonid, giving the posterior teeth a crown which suggests the primitive mammalian condition.

Although this type has the same dental formula as *Cyclogomphodon platyrhinus*, it cannot be referred to this genus as the posterior molars are entirely different in shape, as may be seen by comparing the figure given with either the type jaw of *Cyclogomphodon platyrhinus* or the jaw described by me in 1905. In the present type, the molars resemble more those of *Gomphognathus*, while those of *Cyclogomphodon* resemble more those of *Diademodon*. It will be therefore necessary to place the type in a new genus. The species is respectfully named after the late John Wood of East London, a most capable observer in several branches of Natural History, especially Geology and Ornithology.



Octagomphus Woodi Broom. Figs. 1—3. \times about $\frac{5}{6}$.

Gomphognathus *mustacus* Seeley (type of *Kannemeyeri*) fig. 4. $\times \frac{5}{6}$.



**Notes on the Hepialid genera *Gorgopis* and *Dalaca*, with
descriptions of six apparently new South African species.**

By A. J. T. JANSE, F.E.S.L.

Through the courtesy of Mr. J. Hewitt, Director of the Albany Museum, Grahamstown, I had the opportunity of examining some Hepialids which are of biological interest and which appear also to be undescribed. Like most members of this family they live in the ground, probably feeding on roots, and make tubular structures, but one of them, *G. crudeni* sp. n., closes the tube with a lid in a similar way as the trap-door spiders do. (See the S.A. Journal of Science XIII, p. 196, 1916.)

All these species belong to the genera *Gorgopis* and *Dalaca* but in studying these genera I found that their limits had been hardly defined, in fact, the last descriptions given were those of Walker in his Cat. Het. Brit. Mus. VII in 1856!

The distinctions given there, however, are insufficient to use them for the separation of the two genera, both as given in the synopsis and in the full descriptions, as can be seen in the following comparison:

Walker's Synopsis:

<i>Dalaca</i> Wlk.	<i>Gorgopis</i> Hübn.
legs strong.	legs slender.
palpi obsolete.	palpi distinct.

Walker's description :

Dalaca Wlk.

Body rather slender, slightly hairy.
 Proboscis and palpi obsolete.
 Antennæ stout, setaceous, somewhat thickened and flattened.
 Legs rather slender, slightly pilose (in synopsis legs are strong).
 Wings rather narrow.
 Fore wings straight along the costa, somewhat rounded at the tips, rather oblique, and very convex along the exterior border;
 veins much like those of *Hepialus* in structure.
 Male: Antennæ minutely serrated, as long as the thorax. Hind tibiæ tufted with long hairs (above they are slightly pilose).
 Female: Antennæ nearly as long as thorax.

Gorgopsis Hübn.

Body rather slender.
 Palpi rather long and slender, extending beyond the head; third joint elongated.
 Antennæ rather deeply pectinated, a little longer than the thorax.
 Legs very slender, slightly pilose.
 Wings narrow, not long.
 Fore wings straight in front, slightly rounded at the tips, very slightly oblique along the exterior border.

After weeding out all the points in which the genera agree according to Walker himself we have: *DALACA* with obsolete palpi and somewhat thickened flattened antennæ, while in *GORGOPSIS* the palpi are *rather* long and the antennæ are *rather* deeply pectinated. (*Italics are mine.*)

In studying the palpi of species which Walker and others place in *Dalaca* I find them usually short, *but always distinct*; in *cretata* Dist. the whole palpus is as long as the second joint of the palpus in *ammon* Willgrn., the third joint almost disappeared; in *rufescens* Hmps. the palpus is about twice as long as in *cretata*, third joint quite distinct; in *ammon*

Willgrn. the palpus is as long as in *C. libania* Stoll. and it was probably therefore placed by Walker and others in the genus *Hepialus*. However, the shortness and simple structure of the antennæ in this genus throws it out of this genus at once and moreover in *Hepialus* the palpi should also be obsolete according to Walker, though in reality they are very short. I think *ammon* is a *Dalaca* with unusual long palpi. The antennæ give in my opinion a quite reliable distinction, the long pectination of those of the male and often in the female is not found in any other genus recorded from South Africa up to now, though I must confess that I would not have founded a new genus on characters based on one sex only.

Mr. A. Quail has pointed out in his paper in the T.E.S.L. p. 430 (1900) that the antennæ in this family are in many respects peculiar and specialised and I also think that a study of these organs will give useful information for the limitation of different genera.

On account of the peculiar structure of the antennæ of *G. bacotii* Quail, I hardly think it is a *Gorgopis* but rather a *Dalaca* in which the lamellæ are a little longer than on most species of this genus. The study of the structure of the front tibiæ of the species of both genera also does not supply reliable distinctive characters, though the process is half or less than half the length of the tibiæ in *Dalaca* and over half in the species of *Gorgopis* I have examined. The venation is equally useless, as it shows remarkable constancy. The only difference in venation I could find was only of specific value and that only in veins 7, 8 of the fore and hind wing. In *D. rufescens* these are far apart, in *D. cretata* apart in fore wing and from a point in the hind wing; in *D. ammon* they are shortly stalked in both wings as is always the case with all species of *Gorgopis* I examined.

It is interesting to note, that *ammon* agrees with *Gorgopis* in wing venation as well as structure of palpi more than any other species of *Dalaca* I have seen.

GORGOPIS Hübn.

Verz. Bek. Schmett, p. 198 (1822). type: *libania*.

The following redescription is made from *libania*.

Male. Proboscis absent; palpi porrect, about as long as length of eye, first joint with long spreading hair on underside, second joint nearly half length of palpus, cylindrical and tapering, covered with rather long hair on underside, third joint a little longer than half second joint, not hidden in hair and covered with short hair (in some species the third joint is much shorter, but in that case the second joint is relatively longer so that the palpus does not become shorter); antennæ bipectinate, nearly half length of costa, branches tapering towards tip and about eight times thickness of shaft, outer branch much less curved than inner one, both minutely ciliated and with three to five long bristles of which two are always on the end of the branch, joints oblique, indicated by a black line; fore leg with a process over half length of tibia; abdomen longer than hind wing. Fore wing subtriangular, costa slightly hollow at middle, apex well rounded, termen very oblique and rounded, tornus well rounded, inner margin gently arched; the venation does not show anything special except that there are two forked veinlets in the cell of the fore wing, but in other species only one forked veinlet is present. Hind wing in shape like fore wing but costa more hollow and tornus more rounded.

Female. Antennæ bipectinate but the branches are about five times the shaft; in some species, however, the antennæ are simple or lamellate as in the males of *Dalaca*; length of antennæ about one-third of costa as wing is much longer than in male. Fore and hind wing as in male but nearly one-third longer.

This genus is typical for Africa as only two species have been described from other continents; only one is from Central Africa and all the others are from South Africa.

The following species belong, I think, to this genus:

libania Stoll., Papil. Exot. 4. t. 356. F. (1782).

auratilis sp. n.

- caffra* Wlk. Cat. Het. Brit. Mus. VII. p. 1565 (1856).
crudeni sp. n.
fuscalis sp. n.
intervallata Warr. Ann. S.A. Mus. X. p. 507. pl. XLI. f. 29 (1914).
albipilum Warr. l.c. X. p. 506. p. XLI. f. 27 (1914).
plurimaculata Warr. l.c. X. p. 507. pl. XLI. f. 26 (1914).
olivaceonotata Warr. l.c. X. p. 506. pl. XLI. f. 28 (1914).
butleri Dew. Verh. Leop. Karol. Acad. 42. p. 64. t. 3. f. 25 (1881).
zelleri Dew. l.c. 42. p. 64. t. 3. f. 22 (1881).

Gorgopis crudeni sp. n.

Male. Head, palpi, thorax, legs, abdomen and wings olive-brown (xl),* antennæ maize yellow (iv), shaft with fine oblique transverse black lines; thorax in front and costa of fore wing shaded with fuscous (xlvi), wings on upper and under sides silky glossy; cilia olive-brown with a fuscous basal line.

Female. Like male, but less dense scaling on wings, and abdomen covered with chamois (xxx) hairs.

Antennæ of male pectinated as in *libania*, in female 1/4th of costa and pectinated, but the branches are about half the length of those of male. (This at once separates this female from the female of *caffra*, which it resembles very much in every other respect though *caffra* is usually larger.) Palpi rather long (about diameter of eye), second and third joint of equal length, second joint obliquely ascending, third porrect, first and second joint with long spreading hairs but third joint with shorter, more depressed hairs.

*All colour names mentioned are those of Ridgeway's "Color Standards and Nomenclature," 1912; the figures following each name indicate the number of the plate in that work.

Fore wing as in *libania* except 4 and 5 rather far apart, veinlet in cell with two branches, one to vein 4 and one to above vein 5.

Hind wing as in *libania*.

This species very much resembles *G. caffra* but in the male of *caffra* the hind wing is much lighter than the fore wing if the latter is as dark as in *crudeni*. The colour of the fore wing is then not uniform, but a postmedial lighter coloured indistinct band is usually visible and the spaces between the veins are lighter. The female is distinguished at once by the pectinate antennæ in the former.

I have much pleasure in naming this species after Mr. F. Cruden, who first found the "Trapdoor" caterpillar and was successful in rearing the specimens. Hab. Alicedale, 10-15 April, 1917.

Exp. male 32 mm., female 42 mm.

Type of male and female in collection Albany Museum, two male cotypes in coll. Janse, which specimens were caught at light at the same place, two other bred specimens (male and female), the first reared by Mr. Cruden, but in very bad condition, in the Transvaal Museum collection.

Gorgopis auratilis sp. n.

Male: Palpi and hairs of frons glossy olive-brown (xl), vertex of head and front part of thorax brussels brown (iii), remainder of thorax and the whole abdomen with cinnamon-buff (xxix) glossy hairs; eyes ciliated with fuscous-black hairs; antennæ antimony yellow (xv); underside of thorax and abdomen ochraceous-tawny (xv); legs mummy brown (xv).

Wings: ground colour of both wings cream buff (xxx); costa of fore wing brussels brown near base, gradually becoming cinnamon-buff; base of wing with long cinnamon-buff hairs (in the male cotype from Natal the costal marking is darker, more narrow and more sharply defined); hind wing with the costa cinnamon buff; cilia cream buff with basal third cinnamon buff. The wings have no markings, but the veins stand out a little darker, owing to the more dense scaling; the covering of the wings consists of scales and some hairs.

Female: Hairs on palpi, head, thorax and abdomen avellaneous (xl) on upper side, tawny-olive (xxix) on under side, legs tawny-olive; antennæ cinnamon buff, shorter than in male and branches about half those of female; wings on upper side cream colour (xvi); costa of fore wing avellaneous; cilia of ground colour; scaling much thinner than in male and consisting more of hairs. Under side like upper side.

Exp. male 31-40 mm., female 46.4 mm.

Hab. male type from Rietfontein (Pretoria district) 3.III.05; female type from Pinetown (Natal) 4.IV.02; two male cotypes from Rietfontein and one male cotype from Pinetown caught on the same dates; all in coll. Janse. In the same collection are two other rather worn specimens from Empangeni (Zululand) in Oct. 1913 which I consider to belong most probably to this species, though they are considerably smaller.

This species closely resembles *G. libania*, but it is less robust and much lighter in colouring; the pectinations of the antennæ of *auratilis* are shorter and the two wings differ very little, if at all, in colouration; in the female of *libania* the branches of the antennæ and the antennæ themselves are considerably shorter.

It is peculiar that I have not met this species more often during the last twelve years, though I have taken *libania* freely every year.

Gorgopis fuscalis sp. n.

Male: Palpi, head, thorax on upper and under side, and legs with glossy sepia (xxix) hairs; pecten of antennæ antimony yellow (xv), in Pretoria specimen cinnamon-buff (xxix); abdomen on upper side ochraceous-buff (xv), on under side ochraceous-tawny (xv).

Fore wing with ground colour avellaneous (xl); costa broadly suffused with sepia; all fasciæ light buff; a fascia from base below lower median to origin of vein 4, where it broadens somewhat; near base a transverse sepia line on transverse vein from lb. to lower median; a narrow fascia between 4 and 5; a fascia from before middle of cell above the veinlet,

continued between vein 5 and 7 and divided into two by vein 6; rather short fasciæ between 7 and 8, 8 and 9; indications of fasciæ between 9 and 10, and stalk of 9, 10 and 11; a faint line of light coloured scales above vein 12 to near costa; cilia long near base of wing and buff-yellow (iv), other cilia avellaneous with sepia base; veins narrowly indicated by sepia scaling.

Hind wing pinkish-buff (xxix), with costal area and veins tawny-olive (xxix); cilia as on fore wing.

Underside avellaneous, costæ olive brown (xl) and veins cinnamon-buff (xxix).

Exp. 21.5 - 24.5 mm.

Hab. male type from Wonderfontein (Middelburg district) 23.X.1910, three female cotypes from Pretoria 20.III.1915, and Machadodorp 31.X.1910.

This species resembles *C. caffra*, but is much larger and has light fasciæ while the hind wing is somewhat darker.

DALACA Wlk.

Cat. Lep. Het. B.M.VII. p. 1557 (1856).

Five species are mentioned by Walker as belonging to this genus, 3 from America and 2 from South Africa, but he does not stipulate which of these five is the type of the genus.

As *D. erul* H.-S. is the only species of these five which I have in my collection I use this species as the type of this redescription.

Male: Proboscis absent; palpi porrect, rather short, just equal with frons, covered with long hair in which the third joint is hidden (in some species the palpi are longer, but hardly as long as in *Gorgopis*); antennæ very short, less than one-third of costa, flattened, lamellate on both sides of the shaft and lamellæ together about as thick as shaft, longest lamella on outer side, lamellæ covered with short rather dense hairs; process of fore leg about half length of tibia, in other species rather less.

Fore wing in shape as in *Gorgopis* but termen less oblique; veins 5 and 6 on a very short stalk (in other species, however,

these veins are well apart); 7 and 8 apart, but in *ammon* shortly stalked. Hind wing like fore wing, but veins 5 and 6 well apart.

The female of this species is not known to me, but in the female of *rufescens* the antennæ are shorter in proportion to the costa of the fore wing as the wings are longer than in the male.

This genus is only known from South and Central America and South and Central Africa; of the 18 African species South Africa has 16, to which I add three more.

- exul* H.-S. Aussereur. Schmett. I. t. 10. f. 43 (1855).
- tumidifascia* Hmps. A.M.N.H. 8. VI. p. 157 (1910).
- metaleuca* Hmps. 1. c. 8. VI. p. 158 (1910).
- goniophora* Hmps. 1. c. 8. VI. p. 157 (1910).
- fuscescens* Hmps. 1. c. 8. VI. p. 157 (1910).
- rhodesiensis* Hmps. 1. c. 8. VI. p. 157 (1910).
- ammon* Wllgrn. Wien. ent. Mon. 4. p. 43 (1860).
- nomaqua* Wlk. Cat. Lep. Het. VII. p. 1560 (1856).
- rufescens* Hmps. A.M.N.H. 8. VI. p. 158 (1910).
- furva* Hmps. 1. c. 8. VI. p. 158 (1910).
- troglydytis* sp. n.
- leucophæa* sp. n.
- cretata* Dist. A.M.N.H. 20. p. 211 (1897).
- semicanus* sp. n.
- ibex* Wllgrn. Wien. ent. Mon. 4. p. 43 (1860).
- leucocyma* Hmps. A.M.N.H. 8. VI. p. 159 (1910).
- albirivula* Hmps. 1. c. 8. VI. p. 159 (1910).
- albistriata* Hmps. 1. c. 8. VI. p. 159 (1910).
- hololeuca* Hmps. 1. s. 8. VI. p. 160 (1910).

Dalaca troglydytis sp. n.

Vertex of head and the palpi covered with olive-brown (xl) hairs, on palpi mixed with fuscous (xlv) hairs; antennæ sayal brown (xxix); thorax with light buff (xv) hairs mixed with avellaneous (xl) hairs; abdomen with long light buff hairs on basal third and short hairs on remaining part; underside of thorax and abdomen buffy brown (xl); legs olive brown (xl).

Fore wing with ground colour buffy brown, costa as far as upper median tinged with hair brown (xlvi); a subbasal oval fuscous-black (xlvi) macula below lower median, somewhat contracted at 1*b* and surrounded by a ring of cartridge buff (xxx) scales; a postmedial band of ground-colour, on both sides defined by a narrow line of cartridge buff scales on outer and a somewhat broader line on inner side, beginning at vein 9 and oblique to vein 2 where it emits a spur to inner margin at near terminus of 1*b* and running along lower median to join ring of subbasal macula, at between vein 2 and 3 the inner edging curves upwards into the cell and curves down again at half of lower median; at beyond subbasal part of band a fuscous macula and two other maculae of same colour beyond it above and below the band; a fuscous-black broad medial shading, sharply defining the inner light line of band, from beyond vein 2 to 7; two triangular maculae at terminus of band between 7-8 and 8-9; fuscous rounded maculae defining outer light line of postmedial band between the inner marginal spur and vein 2, between all veins from vein 2 to 6, the four last maculae somewhat edged with cartridge buff scales on outer side; between vein 6 and 7 a long semicircular fuscous macula from postmedial band to termen, rounded and edged with cartridge buff line on upper side; a cartridge buff subterminal line from terminus of vein 10 to centre of macula at vein 7; two fuscous maculae beyond that line between veins 7-8, 8-9 and edged terminally by V-shaped light marks; a narrow cartridge buff line along inner margin from near base to 1*b* before which it emits a little spur upwards to reach that vein; a similar line from half way the spur of post medial band to vein 2; seven V-shaped terminal cartridge buff marks between veins 2 to 9 so as to form a zigzag interrupted terminal line; on inner side these V-shaped marks are shaded with fuscous; cilia shiny cinnamon-buff (xxix) shaded with olive-brown at base.

Hind wing shiny cinnamon-buff with olive-brown shading especially along the costa; some light postmedial shading suggesting postmedial band of fore wing; 7 light coloured V-shaped terminal marks as on fore wing but less defined and without the fuscous shading on inner side; cilia shiny cinna-

mon-buff with basal part gradually becoming olive-brown.

Underside of both wings with the ground colour shiny buffy brown with the costæ broadly suffused with olive-brown.

Exp. 36.4 mm.

Male type from Alicedale reared from caterpillar living in tubular structure under the ground; in coll. Albany Museum.

Dalaca leucophava sp. n.

Male: Head, thorax and abdomen above as in *troglydytis*, under side and legs buffy-brown (xl); antennæ olive-brown (xl).

Fore wing with ground colour olive-brown; a basal fuscous (xlvi) spot on lower median; a few light coloured scales beyond it; a subbasal fuscous macula as in *troglydytis* but the ring around it *white* and *imperfect* on upper and lower part; a *white line in cell* at terminal half touching inner white edging of postmedial band; postmedial band as in *troglydytis* but *no well defined macula* in ground colour, light edging *white* and with *no dark shading* on inner side; on outer side some dark shading between 1b and 7 but *ill-defined* and *confluent with ground colour*; a subterminal line as in *troglydytis* but *white*, terminal markings between the veins more or less *triangular, white* and *faintly* defined on inner side with dark shading; *no white edging on inner margin* but a small quadrate white inner marginal patch a little before 1b; cilia of both wings avellaneous (xl), its base tinged with fuscous.

Hind wing with ground colour shiny buffy-brown (xl); costa suffused with fuscous; *postmedial marks better defined* than in *troglydytis* and *white*; terminal marks *ill defined* and *white*.

Underside shiny buff-brown, the costæ suffused with fuscous.

Exp. 38 mm.

Hab. Type from Mimosa (Cape Colony) collected by Mr. F. W. FitzSimons in April; in coll. Janse.

Another male specimen in rather rubbed condition was caught at Alicedale and is in the Albany Museum.

This species closely resembles *trogodytis* but is distinct in many points, as a study of the characters printed in italics will show at once.

Dalaca semicanus sp. n.

Male: Ground colour of head, thorax, abdomen and fore wing above and underneath cinnamon-buff (xxix); head in front, palpi, and legs on outer side with hazel (xiv) hairs; antennæ Sanford's brown (ii); hairs on thorax and abdomen on under side and legs on inner side mixed with light buff (xv) hairs; costæ of both wings on upper and under side tinged with hazel.

Fore wing with all markings silvery white; a pointed subcostal fascia till a little beyond half of wing; a fascia between lower median and 1*b* from base to half lower median where it curves upwards into the cell as far as vein 5, interrupted by a hazel line at lower median and lower branch of veinlet, a short projection into the cell at half its whole length; an oblique slightly curved fascia from vein 4 to near apex, leaving at vein 4 a narrow band of ground-colour between its origin and the terminus of the former fascia, interrupted at vein 8, 9, 10; white fasciæ between all veins from 1*b* to 9, all reaching termen, first faint, second more pronounced, third distinct and connected with base of oblique fascia, but fifth, sixth, seventh, eighth and ninth are more interrupted by the ground-colour near base, till eighth and ninth are not much more than terminal white spots; cilia of ground colour.

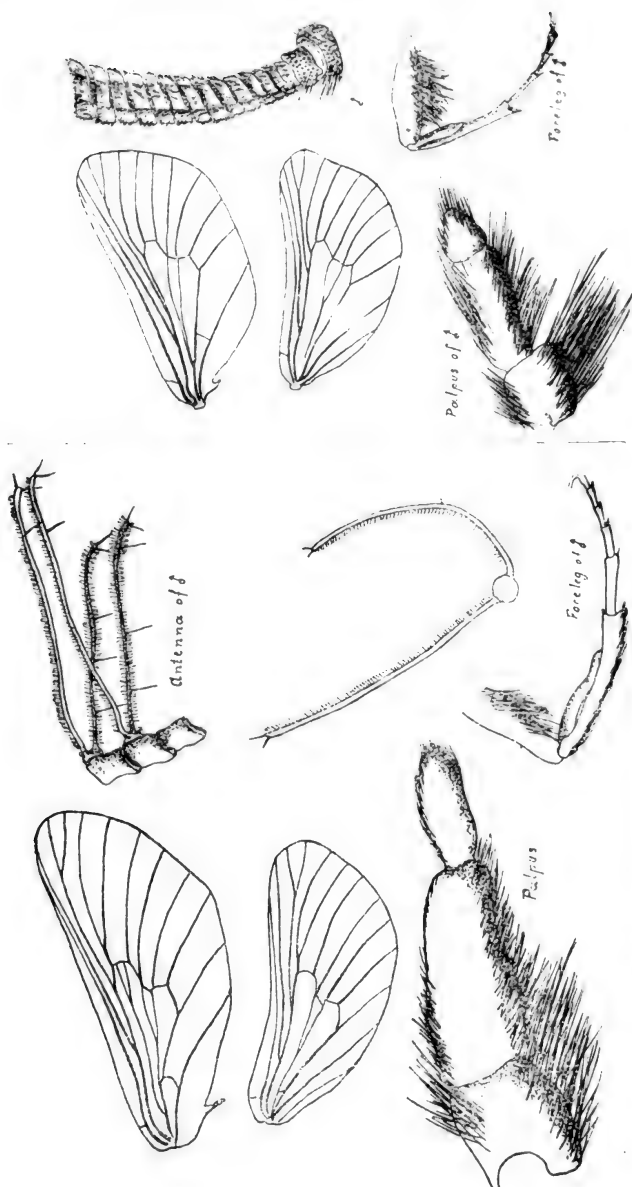
Hind wing and its cilia uniform tawny-olive (xxix) lighter towards termen.

Under side of both wings cinnamon-buff, discal area slightly darker, no markings visible. Lamellæ of antennæ in this species as in *ibex*, fore wing with the costa slightly incurved, termen rather erect, rounded, inner margin rounded at middle; hind wing rather small.

Exp. 30 mm.

Type in coll. Janse from Tongaat (Natal); I have also seen another specimen from Howick in the Durban Museum,

This species comes close to *albirivula* from which it can be separated at once by the hind wing not being white and the fasciæ of the fore wings differ from it in details.

Fig. 2. *Dalaca rufescens* Hmpsn.Fig. 1. *Gorgopsis libania* Stoll

**Description of a Trap-door Caterpillar (Fam. Hepialidae), from
Alicedale, Cape Colony.**

BY C. B. HARDENBERG, M.A.

In the South African Journal of Science, 1916, page 196, Pl. II, Mr. Frank Cruden published a note on the occurrence of a trap-door caterpillar at Alicedale, Cape Colony, and gave a photographic reproduction of one of these caterpillars and the entrance to its nest, on which the trap-door arrangement is very clearly shown.

Moths obtained from these caterpillars were sent to Mr. Janse for determination and have been described by him under the name of *Gorgopis crudeni*.

The material at my disposal consisted of two caterpillars, received through the kindness of Mr. John Hewitt, Director of the Albany Museum at Grahamstown. These two specimens had been collected by Mr. Frank Cruden at Alicedale in June, 1917. They agreed in all essential points, and presumably belonged to the same species. Unfortunately, I have no other larval representatives of this family and cannot therefore draw any comparisons, nor judge whether this caterpillar shows any special features in adaptation to its trap-door building habit.

Length of caterpillar 22 mm. (alcoholic specimen). Width of head case 2.5 mm.; prothorax 3 mm.; mesothorax 3.5 mm.; abdominal segments 2.5 mm., with sides sub-parallel up to the posterior edge of the 8th segment, from which point the body tapers abruptly caudad. Head, thoracic shields, setiferous plates, ventral aspect of thorax with legs, subspiracular ridges of abdominal segments and prolegs shiny; the remainder of the body dull. Ground colour of body pale smoke grey (XLVI);* annulets, infra-spiracular ridges of segments, ventral aspect of thorax, thoracic legs and abdominal prolegs, pale olive buff (XL); dorsal thoracic shields, and setiferous plates on segments

*The colours are indicated according to Ridgway's Color Standards and Nomenclature, Washington D.C. 1912.

olive brown (XL); ground colour of head buffy brown (XL); markings on head, also spiracles and hooks on prolegs light seal brown (XXXIV).

Head. Vertex rounded, posterior edge of parietals margined, vertex triangle absent, median interparietal suture short, a little over one-fourth the distance between vertex and anterior edge of clypeus. Parietals with numerous longitudinal grooves. Frons high, extending to two-thirds of the total height of the head capsule. The upper part of the head and also the caudal parts of the lateral and ventral aspects are mottled with dark brown (pattern shown in Figs. 3 and 4); the adfrontals and genae light coloured. The intensity of the pigmentation shows considerable individual variation and in the lighter coloured specimen these dark portions showed much lateral branching. The head capsule shows very little sculpture; it appears quite smooth on the right surfaces and shows slight, diffused polygonal facets on the pigmented areas.

Position of setae (Figs. 5, 6 and 7.)

Frontal region. The frontal seta F. is placed low down, on the basal fourth of the frons; the frontal puncture F.a. very close to it but laterad of the seta. The suture between frons and clypeus is very indistinct.

Clypeal or epipharyngeal region. Both setæ Ep. 1. and Ep. 2. are situated far outward; the former near the clypeo-frontal suture.

Adfrontal region. The adfrontals are large: Adf. 1. placed about half-way up, Adf. 2. right near the tip. No adfrontal punctures could be found on the specimens examined.

Posterodorsal region. Pd. 1. placed lower than Adf. 1. and laterad, Pd. 2. above Adfr. 1. and near the parieto-adfrontal suture. Further, the parietals show several punctures. One is situated mediad of Pd. 1. and near the adfrontal (this may be Pd. 1a.); another laterad of Pd. 2. (which probably is Pd. 2a.); both these punctures being rather far away from their corresponding setæ. From Pd. 2. towards the vertex there are four punctures almost in a line, the middle two of which bear rudimentary setæ.

Anterodorsal region. Ad. 1. is placed very near the oral edge with Ad. 2. closely approximated to it. Ad. 3. on the other hand is situated very high up and near the lateral edge. No anterodorsal punctures could be observed.

Lateral region. This shows one seta L.1. near the edge, and about level with Adf. 2.

Ocellar region. The ocelli are six in number. The three anterior ones are placed in a line roughly parallel to the anterior edge, the middle one slightly receding. Of the posterior set the upper two are close together, the remaining one standing isolated. Ventrocaudad of this we find seta O.1.; seta O.3. is placed at about the centre of the quadrangle formed by the upper two ocelli of the anterior and posterior row. Seta O.2., which should be situated somewhere between the hindmost ocelli, I was not able to locate on either of the two specimens examined.

Sub-ocellar region. S.O.1. situated in the antero-median corner; S.O.2. placed latero-caudad, a considerable distance away from the anterior edge, with S.O.2a. close by; S.O.3. rather far back, close to the articulation between cardo and stipes of the maxilla. Being long, and placed on the light coloured area, the last mentioned is the most conspicuous seta which we see on the ventral aspect of the head.

Labrum. Width about twice the total height; strongly chitinated, the epipharyngeal thickening being very well developed. Lobes broadly rounded, median cleft reaches to about one-third of the total height. M.1. close to the median line, M.2. laterad and higher than M.1.; M.3. moved close to the median line. Laterad of M.1. and above M.3. we find a double puncture, consisting of a larger lateral and a smaller mesial one, probably the seat of a sense organ; none showed evidence of having borne a seta. L.1. could not be found, L.2. submarginal and placed at the lateral lower curvature of the lobe of the labrum, L.3. placed high up and far mediad, almost below M.2. The epipharyngeal sense hairs are long and narrow, implanted on the lower part of the lobe below a line connecting M.2. and L.2.

Maxillæ. (Fig. 8.) The cardo is small, represented by a

chitinised piece, about as long as broad, widening towards the place of attachment to the stipes. The basal part is more heavily chitinised, where it joins on to the post-mental pieces. The stipes are large, broadening distad, the middle part more heavily chitinised laterally, the anterior and posterior lateral aspects membranous. It bears two setæ, one on the ventral, one on the lateral aspect, with a sensory pit between them. Palpiger low and broad, forming a ring, broadening mesad; on its lateral ventral aspect it bears one conspicuous bristle. Its lower median corner is prolonged into a triangular, pointed process. On the palpiger follows the maxillary palpus, the first joint of which is shaped like an inverted truncated cone and bears a sense organ on the lateral side near the distal end; the second joint is cylindrical and longer than the first. On its membranous distal end it bears a long conical third joint and a minute pointed sense hair on the ventro-lateral portion near the base of the third joint. The maxillary lobes are represented by a broad plate, the distal part of which is membranous. It reaches as far as the end of the second palpal joint. On its chitinous part near the base it bears a conspicuous bristle. On its membranous part we find on the ventral side two sharply pointed conical bristles (the distal one the shorter), and between them two slender cylindrical rods, each about as long as the distal bristle and bearing a minute sense cone at its tip. On the dorsal side we find three dagger-shaped hairs on broad annular bases about equidistant from each other. The length of these could not be ascertained as they appeared to be worn down in both the (mature) specimens examined.

Relative lengths of parts: Cardo 9; stipes 40; palpiger, median side 11, lateral side 6; palpus joints respectively 8, 9, and 4; lobes, from base to tip 15.

Labium. (Fig. 9.) The post-mental pieces show prominently as roughly triangular, strongly chitinised sclerites, sulcate anteriorly to receive the articulation of the cardo. They are situated almost transversely, the median tips directed toward each other, but widely separated. In front of this comes the submentum, the posterior part of which is directed ventro-distad and is slightly chitinised. The anterior part,

much narrower, is membranous but bears at its distal third a seta on each side near the median line. From these setæ, which stand on darkly pigmented areas, a curved chitinous band stretches forward to the stipes of the first maxillæ and joins the articulation between these and the sub-mentum. At the oral end of the submentum and the beginning of the mentum (about level with where the palpiger joins the stipes), there is on each side a strongly curved chitinous rod. The mentum itself is fairly heavily chitinised, shaped like an inverted funnel. At its anterior third it bears a seta on each side near the median line. Immediately above this we find laterally a rounded trapezoidal sclerite, the palpiger, which bears the one-jointed palpus, consisting of a short cylindrical rod, bearing a long bristle at its end. Between the palpigers, at the anterior end of the mentum, we find two small punctures or annular sense organs. The spinneret is surrounded at its base by a short half-cylindrical chitinised piece on the ventral side. The mentum and its appendages are strongly deflected ventrally.

Antennæ. (Figs 10 and 11.) The basal cone is not entirely membranous, being chitinised at its lower portion. The first joint of the antennæ is the longest, its distal half more strongly chitinised than the proximal portion, which can be withdrawn into the basal cone. Near its distal end a sense organ is visible. The second joint is short, its width slightly exceeding its height. On its mesial aspect it bears a long bristle and a smaller seta. Its terminal surface is membranous and bears besides the short cylindrical third joint two sense cones on chitinised bases, and a minute cone without base. The third joint has a similar cone but larger than the two previously mentioned, and two small papillar cones without bases. In addition to this, it bears the minute narrow-conical fourth segment, ending in a small pointed bristle.

Thoracic segments. (Fig. 12.) Of these the mesothorax is the widest, exceeding the prothorax by one-half mm. The prothoracic shield, slightly sulcate on its posterior margin, is a strong chitinous plate, covering the entire dorsal aspect of the thorax and part of the sides. It contains the prothoracic

spiracle. The median, and the anterior halves of the lateral parts are light coloured, the remainder more deeply pigmented. Near the latero-caudal edge of the shield we find the large prothoracic spiracle, placed almost transverse.

At the front edge we find a row of setæ, three on each side, about equal distances apart. These are followed at the antero-lateral corner by a group of two, placed close together, the lateral one the longer. Latero-caudad of seta 1. (counting from the median line), and again mediad of 3, we find an annular sense organ. Between the antero-lateral group and the spiracle there are two setæ, and also a couple behind the space between 2 and 3. Of these two latter groups, one of each is situated in the centre of a peculiar eye-like spot, the significance of which is unknown to me.

Over the surface of the prothoracic shield, and also on meso- and meta-thorax, we find several groups of peculiar smooth-surfaced cells. On the prothorax there is one such group just behind the space between seta 2. and 3., while several groups are scattered near the posterior edge.

The eye spots above mentioned consist of a strongly chitinated annular sunken wall, from the centre of which a strong bristle arises. (Fig. 19.) The light coloured surrounding area, rounded triangular in shape, is membranous, the membrane covered with numerous flattened sharply pointed papillæ or villi, similar to those covering the skin of the abdominal segments, but somewhat broader and more strongly chitinated. These papillæ are mostly directed mediad. They are more closely approximated around the edges of the pit, and bend down into it, lining the inside of the wall for a short distance. The use of these spots is unknown to me, but their arrangement and appearance (dark centre and light ring around it) has some resemblance to the four eyes on the anterior edge of the cephalithorax of certain trap-door spiders.

On the side, below the neck shield, there is another, slightly chitinated sclerite, bearing two setæ. Below this, we come to the ventral surface which is almost entirely taken up with the large coxæ and prothoracic legs (see below).

Meso- and meta-thorax. (Fig. 12.) The dorsal aspects of

these are similar. First we find a long, thin transverse sclerite, mostly membranous, slightly chitinated only at its lateral edge, where three setæ are borne. This sclerite is partly covered by a median biconvex plate with the anterior edge slightly, the posterior strongly convex, and which appears equivalent to the light coloured median area of the prothoracic shield. It bears two setæ near its anterior edge. Behind this we find two rounded-trapezoidal sclerites, contiguous on the median line, each with four setæ, three near its anterior edge and one placed behind, near the caudo-lateral corner. These sclerites bear numerous groups of smooth cells. Adjoining these is a lateral sclerite with one hair. Below this, on the lateral aspect, there is a similar sclerite with one seta near its anterior edge, corresponding to that found below the prothoracic shield.

The thoracic legs (Fig. 13) are strongly developed. Coxæ large, roughly triangular in shape, the coxæ of both sides contiguous on the median line, but not fused. The entire median and the inner part of the cephalic edge, where they join the trochanters, strongly chitinated; the remainder very weakly so. The coxæ bear each seven setæ, four long and three short. The longest and strongest arises near the median line, just outside of the chitinated ridge; a second strong seta is placed cephalo-laterad of the first. The third and fourth we find on the edge, one on each side of the connection with the trochanter. One small seta is situated on the median edge between the first and third mentioned; another small one on the cephalic edge, just laterad of the fourth, while an additional small seta arises near the lateral tip of the coxa.

The trochanters are short, triangular, strongly chitinated, and bear one short seta near the distal margin.

Femur, tibia and tarsus well developed, the three joints decreasing only slightly in length. The relative lengths of the three joints, as measured along outside edges were as follows:

First leg: femur 35, tibia 30, tarsus 25.

Second leg: femur 30, tibia 27, tarsus 25.

Third leg: femur 30, tibia 25, tarsus 22.

The femur bears two setæ on its medio-caudal aspect, the mesial one being the longer, the other being situated latero-distad and somewhat smaller. On the tibia we find six setæ, all congregated near the distal end. Four of these surround the end of the tibia, while the other two are placed somewhat proximad, one on the caudal, the other on the cephalic aspect. All six setæ are sub-equal in length. Those on the tarsus are four in number, placed in two groups: the first pair very near the distal end, the other slightly proximad of the first. The claws are not sharply pointed and have a small median lobe at the base.

The area in front of the coxæ bears two small setæ. Behind the coxæ we find a narrow transverse sclerite which has two setæ, one on each side on its anterior edge near the median line.

On the prothorax we find in front of the coxæ a median circular opening, closed by a membrane, rather large. Its significance is obscure; it may be the seat of an eversible sac, like we find in Noctuid caterpillars.

Abdominal segments. (Figs. 14, 15 and 16.) On these, only the middle dorsal and ventral areas are comparatively smooth, the remainder very much wrinkled. The setæ are borne on small convex chitinous plates, which stand out conspicuously against the surface of the segments. The spiracles, found on segments 1 to 8, are small, elliptical in outline on the first seven segments; on the eighth the spiracles are very much larger. The third, fourth, fifth, sixth and tenth segments each bear a pair of prolegs, the anal pair larger and more strongly armed with hooks than the others. We find the following arrangement of setæ and setiferous plates.

On the first abdominal segment we find on each side two conspicuous subdorsal plates each with one bristle, the posterior two (II) more widely separated than the anterior pair (I). Latero-ventrad of these there are three plates, close together, the upper anterior one with two setæ (III and IIIa), the others with only one each (IV and V). In front of this group we see the spiracle. Below the spiracle is a rather large plate with one bristle at its anterior end (VI). Going over to the ventral

side, we find one large plate with two setæ (VII), and a smaller one placed ventro-cephalad of this, with one hair (IX). A smaller seta near the median line stands on a large plate, fused with that of the other side. While the subdorsal plates and those around the spiracle are deeply pigmented, and more heavily chitinised, the plates below the spiracles and those on the ventral side are light coloured and only slightly chitinised. On both the ventral and dorsal sides we find a rudimentary seta near the anterior edge.

The second abdominal segment agrees with the first in the place and arrangement of the setæ, except that the rudimentary one on the dorsal side is lacking.

The leg-bearing segments 3 to 6 agree in general with 1 and 2, but the rudimentary setæ are lacking both dorsally and ventrally, and group VII consists of three setæ instead of two. On segment 8 the spiracle is much larger, but the arrangement of the setæ is very similar to that on the preceding segments, except that group VII consists of two setæ while VIII seems to be absent. Segment 9 is very much shortened, and the setæ are more or less arranged in two transverse rows, the anterior one being formed by I and III, the posterior row containing II, IV, V, VI, VII (two setæ), and VIII. Setiferous plates are lacking below the spiracular area and on the ventral side. On the tenth segment the dorsal setæ are arranged on the large suranal plate; the lateral and ventral setæ are grouped around the base of the anal legs as shown on the diagram.

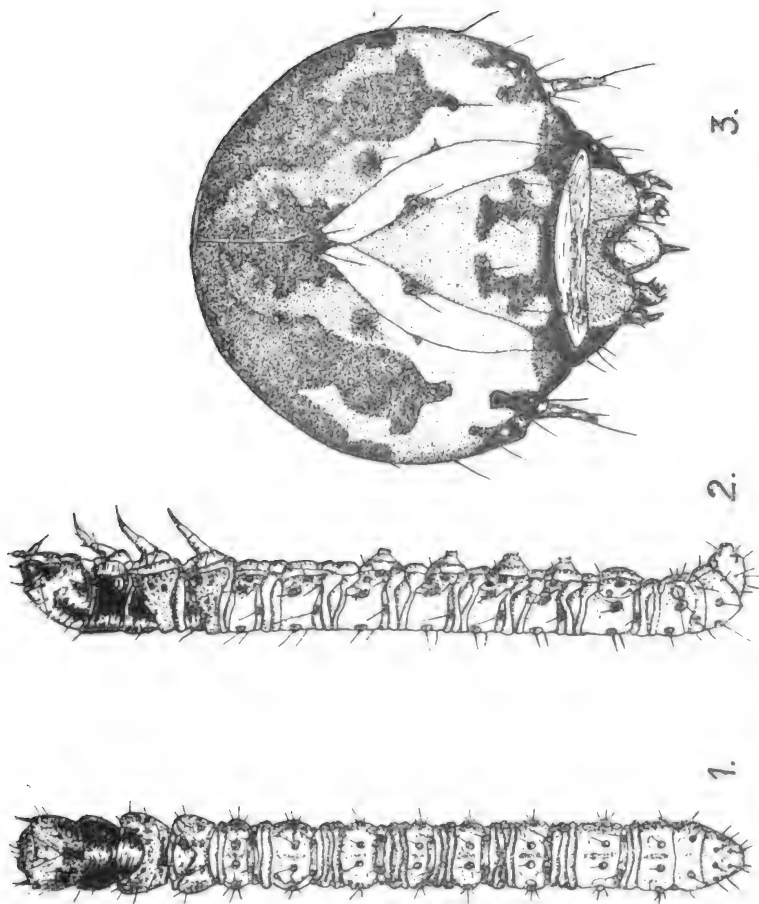
Abdominal prolegs. (Fig. 17.) The hooklets are placed in a transverse oval, closed on all sides. There are three rows of hooklets, of which the inner row contains the largest hooks; following this, there is a row of smaller ones alternating with those of the inner row, and still further outward there is a third row of rudimentary hooklets, again alternating with those of the second row. The number of hooklets in each row is variable, those of the inner row amounting to between 30 and 40. The anal prolegs (Fig. 18) are transverse elliptical in shape. The hooks occupy an area about twice the size of those of the abdominal prolegs. Each area is divided in halves, thus

forming two ellipses, whose open ends face each other. The number of inner hooklets is here also between 30 and 40. On the anterior side of the planta there are three rows like we find on the abdominal prolegs, but on the posterior side only the inside hooks have remained, the secondary and the rudimentary hooks being lacking.

The skin of the abdominal segments (Fig. 20) is armed with numerous finely pointed cones, scattered irregularly and fairly evenly over the surface. Between these there are a number of small rudimentary ones. The cones are especially well developed in the folds of the skin. No special armament or greater development of the cones could be seen on the area between the anal prolegs.

Natal Museum, Pietermaritzburg,

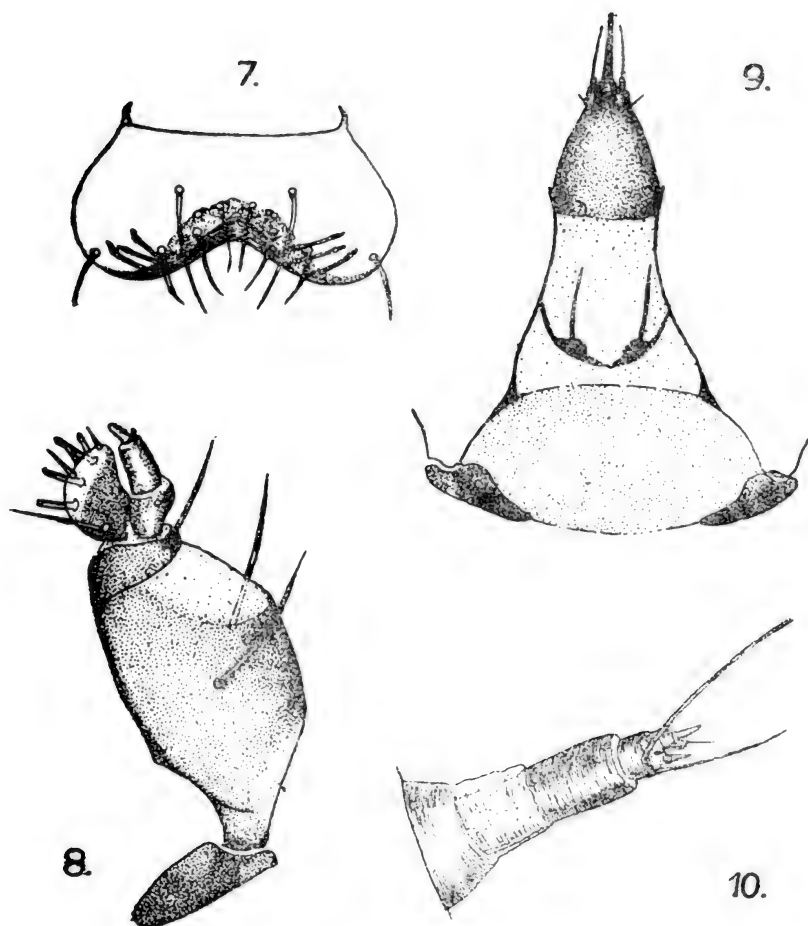
October 5, 1917.



Text figs.—1 and 2. Full grown larva, dorsal and lateral aspects. $\times 4\frac{1}{2}$.

The eyespots on the prothorax are not shown.

3. Cephalo-dorsal aspect of head showing pattern and position of setae. $\times 24$.

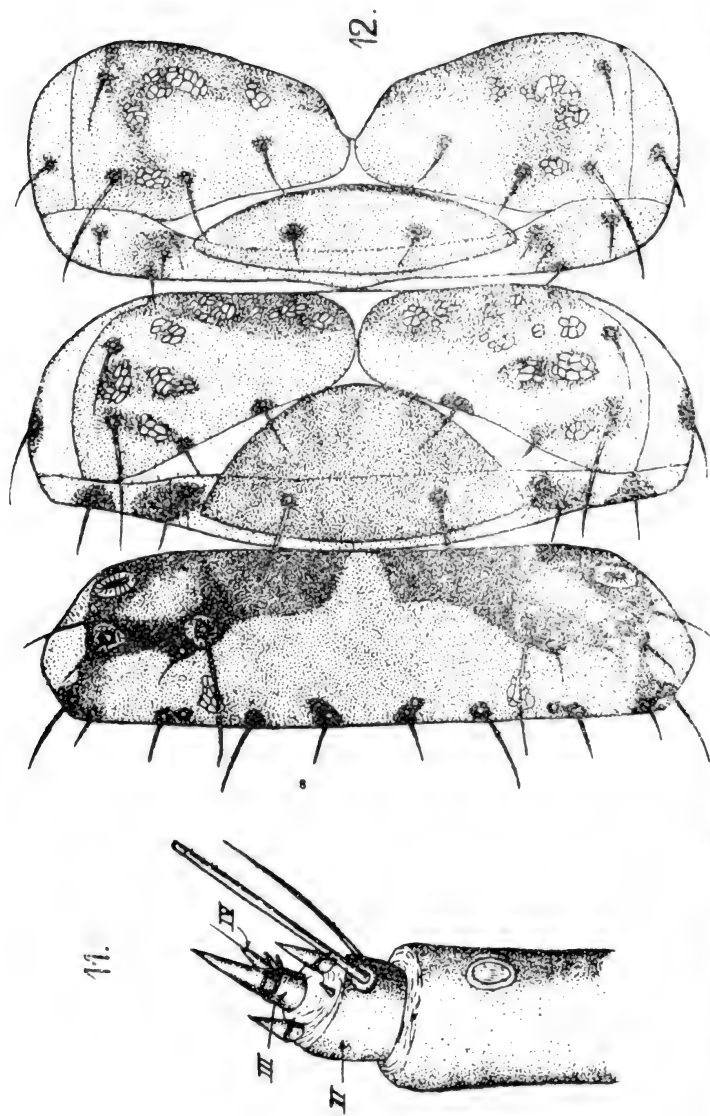


Text figs.—7. Labrum, showing position of setae. x 52.

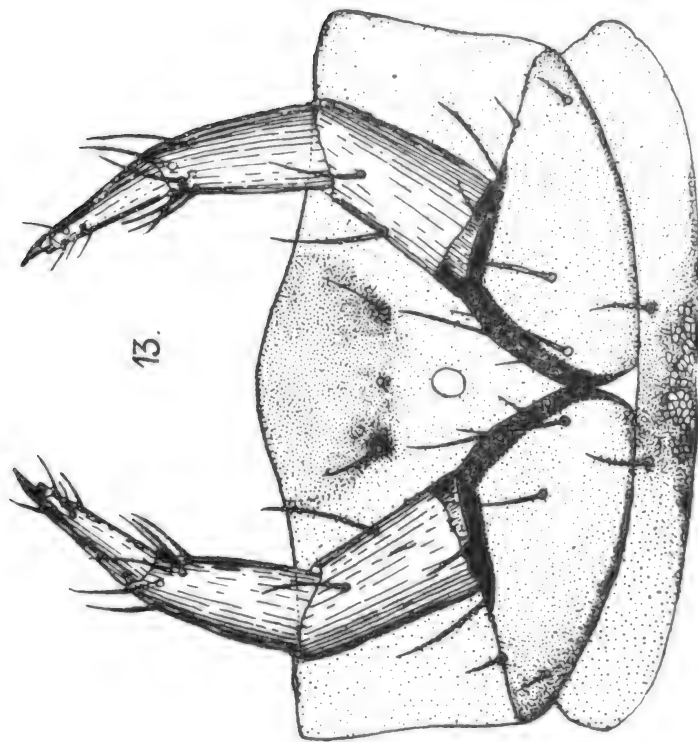
8. Maxilla, left side, ventral view. x 52.

9. Labium. x 52.

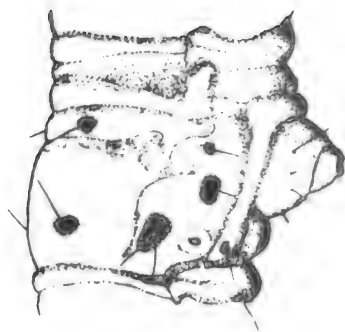
10. Left antenna. x 52.



Text figs.—11. Tip of antenna. $\times 150$. 12. Dorsal shields and thoracic segments, showing sclerites and setae. $\times 25$.



13.



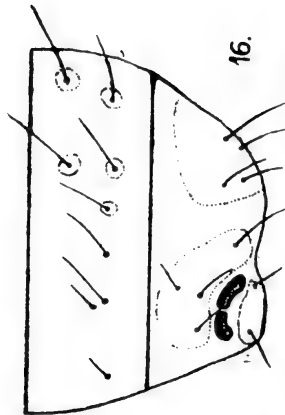
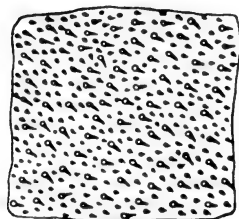
14.

Text figs.—13. Ventral view of prothoracic legs and surrounding area. $\times 26$.
 14. Side view of third abdominal segment. $\times 13$.

15.



20.

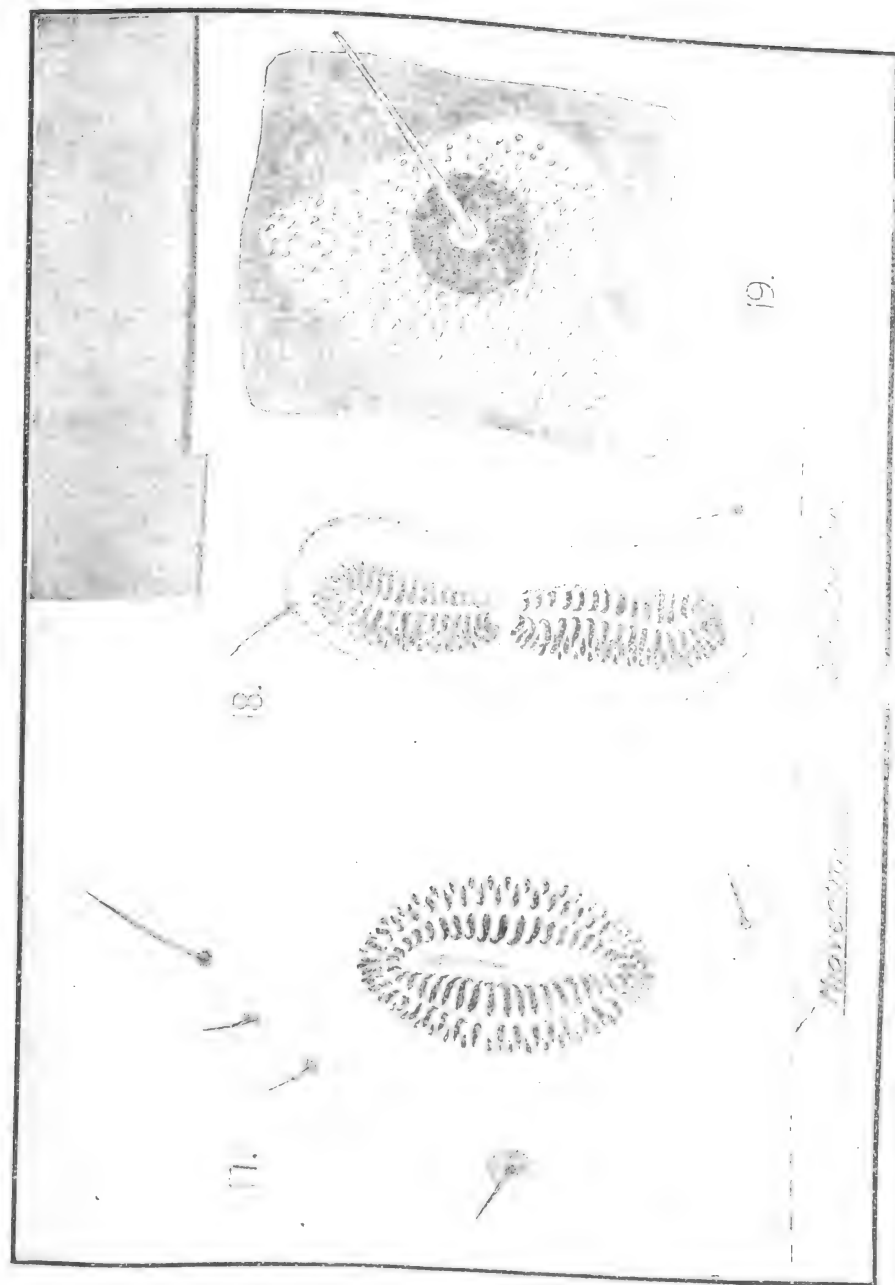


16.

Text figs.—15. Seta plan of abdominal segments, the first, third and eighth being shown.

16. Seta plan of ninth and tenth abdominal segments.

20. Portion of skin between sub-dorsal setae, showing armament. x 53.



Text figs.—17 Left pro-leg of fourth abdominal segment, ventral aspect, showing rows of hooklets, legplate fused with that of right side on median line, and setae. x 74.

18 Left anal pro-leg, ventral aspect, showing bi-lobed arrangement of hooklets, and absence of secondary and rudimentary hooklets on posterior edge. x 74.

19 Eye-spot on Prothorax. x 74.



Some new Lamellibranchs from the Bokkeveld Beds.

By F. R. COWPER REED, Sc.D., F.G.S.

[With Plates IX and X.]

In the course of my examination this year of the collection of fossils from the Bokkeveld Beds in the Albany Museum, three new species of lamellibranchs were recognised and are here described. One at any rate belongs to a genus which has not previously been recorded from this formation in South Africa. A complete revision of the whole fauna is in course of preparation.

SANGUINOLITES ALBANUS sp. nov.

[Pl. IX, figs. 1 and 3 and Pl. X, fig. 4.]

Shell elongate subelliptical, laterally compressed, gaping behind, with broadly rounded subequal ends, inferior margin nearly straight and parallel to dorsal margin, with very weak broad median emargination corresponding to faint lateral flattening of the valves; hinge-line straight with edges slightly exsert, nearly as long as shell. Beaks low, broad, obtuse, situated at about one-third the length of the shell from the front end. Surface of valves ornamented with strong broad rounded subequidistant concentric rugae having fine concentric striae between them.

Dimensions. (No. 102 Albany Museum.)

Length 36 mm. Height 21 mm. Thickness 16 mm.

Remarks. There is only one example of this species, but it is complete with both valves and has the shell preserved. The posterior end is slightly broken. It appears to resemble the Argentine shell figured by Kayser* as *Leptodomus* sp. and to a less extent the Brazilian shells figured by Clarke as *Leptodomus capricornus*†. But McCoy's genus *Leptodomus* has been used in a variety of senses, and it is wiser to refer our shell to the

*Kayser, Zeitschr. deut. Geol. Gesell. XLIX, 1897, p. 289, t. X, fig. 6.

†Clarke, Foss. Devon. Parana, 1913, p. 197, t. XVI, figs 14-18.

genus *Sanguinolites* as re-defined by Wheelton Hind† who distributed most of McCoy's species amongst the genera *Protoschizodus*, *Allorisma* and *Sanguinolites*. Beushausen‡ had been unable clearly to define the difference between *Leptodomus* and *Allorisma*, but American authors continue to use the former name for many Devonian shells, though in Eastman-Zittels' "Text-book of Palaeontology," vol. i (1913), p. 439, *Leptodomus* is given as only occurring in the Silurian. Amongst Lower Devonian species in North America which resemble our Bokkeveld form we may mention *L. prunus* Clarke§ and *L. corrugatus* Clarke.¶

CTENODONTA GRAHAMI sp. nov. [Pl. X, figs. 1, 2 and 3.]

Shell transversely suboval, moderately biconvex, most so in the middle, somewhat compressed anteriorly. Beaks large, high incurved, slightly directed backwards, situated subcentrally but rather nearer the anterior than the posterior end. Inferior margin arched, forming a regular gentle convex curve bending up rather suddenly at each end; anterior end rather blunter and more truncate than posterior end. Pre-umbonal lunule short, lanceolate, not extending more than half the length of anterior hinge-line; postumbonal lunulate area larger, sublanceolate, extending about two-thirds the length of posterior hinge-line. Hinge-line obtusely angulated between beaks with longer posterior portion carrying about 10 short broad transverse teeth in a slightly curved series which near and between the beaks become sharper, longer and more closely placed, probably numbering a further 10-12; anterior pre-umbonal portion of hinge-line carrying a few (7-8) short, broad teeth.

Posterior muscle-scar large, deeply impressed; anterior muscle-scar smaller, deeply impressed, subcircular.

Dimensions. (No. 81 Albany Museum) Bain Coll.

Length 45 mm. Height 34 mm. Thickness 23 mm.

†Wheelton Hind, Mon. Brit. Carb. Lamellibr. (Palaeont. Soc.) Vol. I, 1900, p. 361.

‡Beushausen, Abh. K. preuss. Geol. Landest. N. F. Heft, 17, 1895, p. 264.

§Clarke, Mem. 9. New York State Museum, pt. 2, 1909, p. 76, pl. 16, fig 6.

¶Ibid, p. 109, pl. 28, fig 6.

Remarks. There is only one specimen of this shell, and it consists of a complete internal cast from Warm Bokkeveld. The teeth between the beaks are imperfectly seen, and of the pre-umbonal series only 3-4, only 4-5 being exposed, and of the pre-umbonal series only 3-4, only 4-5 being probably there were 7 or 8. Otherwise the characters are well exhibited. The nearest ally to this species seems to be the shell described by Knod* from the Lower Devonian of Bolivia as *Ctenodonta (Palaeoneilo) musculosa*, but it is like no other Bokkeveld form.

PRAECARDIUM BOKKEVELDENSE sp. nov.
[Pl. IX, figs. 2, 4 and 5.]

Shell subtriangular, cardiiform, nearly as high as long, somewhat inflated. Beaks subanterior, pointed, somewhat incurved. Anterior end of shell gently concave above, sharply rounded below; inferior margin forming a broadly rounded curve; posterior margin obliquely truncated, nearly straight, inclined to the inferior margin at about 80 deg.; posterior lower angle sharply rounded. Valves convex, rather swollen on sides, abruptly truncated and flattened at right angles behind, forming a large elongated lanceolate posterior area. Pre-umbonal lunule sublanceolate, depressed, large but shorter than posterior area. Hinge-line short, straight with one short peg-like tooth in right valve fitting between two similar teeth in left valve; hinge-line thickened. Anterior adductor scars small, ill-defined, situated just below lunule close to edge of valve; posterior adductor scars on posterior area, indicated by large curved impressions at end of hinge-line. Surface of shell ornamented with low, coarse, rounded, equal closely set radial ribs (only visible near margin in internal cast).

Dimensions. (No. 91, Albany Museum).

Length 28 mm. Height 25 mm. Thickness 19 mm.

Remarks. This species is founded on one complete internal cast of a shell, so that the external ornamentation is rather doubtful, but the traces of radial ribs are quite distinct near the margin.

*Knod, Neues Jahrb. f. Miner. Beil. Bd. XXV, 1908, p. 520, t. XXIV, figs. 3-6.

With regard to the generic position of this shell, it seems that it must be placed in the genus *Praecardium* or *Puella* because of the presence of teeth, instead of amongst the *Cardiolidae** which are edentulous but some of which it resembles, especially *Opisthocælus alternans* (Holzapfel).† Clarke‡ has figured a shell from the New York Oriskany formation as *Lunulicardium*? sp. which seems to have much the same characters as our Bokkeveld specimen. But it is difficult to institute a satisfactory comparison when we have only an internal cast with which to deal.

EXPLANATION OF PLATES.

- Pl. IX. *Sanguinolites albanus* sp. nov. 1, side view, $\times 1.8 : 3$,
anterior end view, $\times 2$.

Praecardium bokkeveldense sp. nov. 2, left side, $\times 1.8$
: 4, posterior end, $\times 2.1 : 5$, dorsal view, $\times 2$.

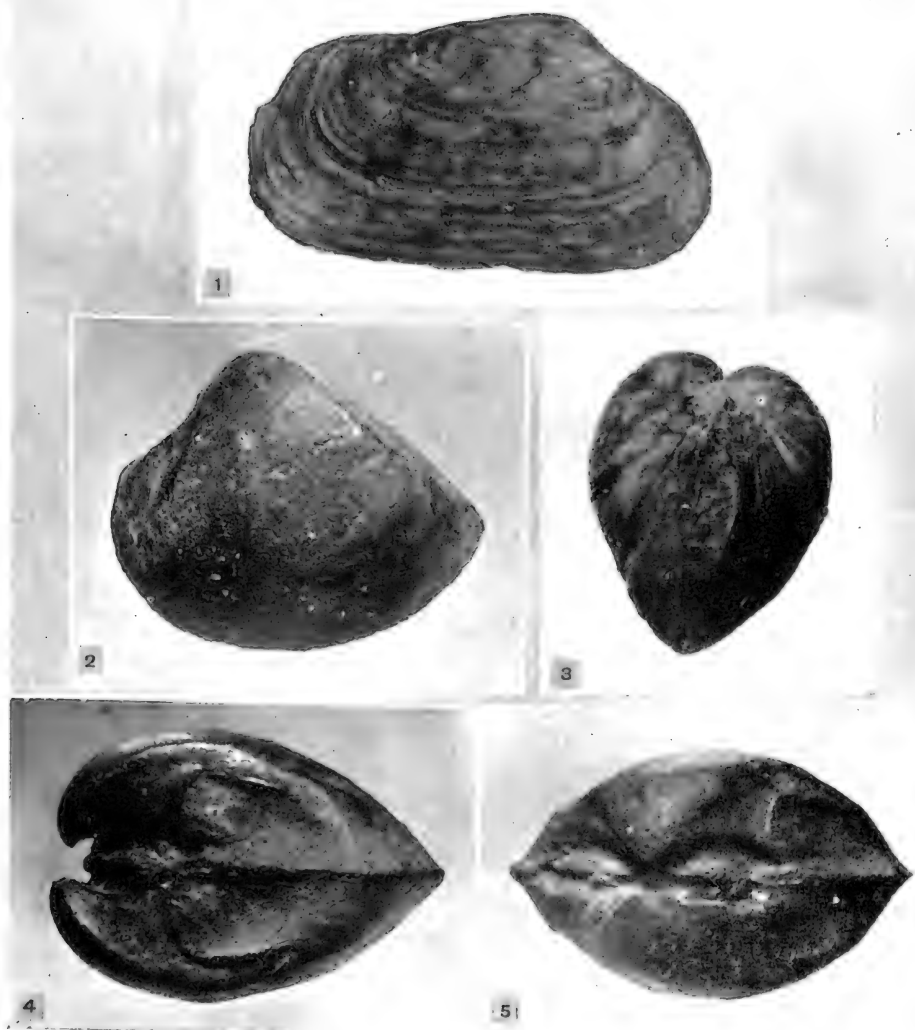
- Pl. X. *Ctenodonta grahami* sp. nov. 1, dorsal view, $\times 2 : 2$,
anterior end, $\times 2 : 3$, right side, $\times 1.9$.

Sanguinolites albanus sp. nov. 4, dorsal view $\times 2$.

*Douvillé, Bull. Soc. Geol. France, ser. 4, XII, 1912, p. 444.

†Beushausen, Abh. K. preuss. Geol. Landesanst. N. F. Heft, 17, 1895, p. 340,
t. 38, figs 14—17

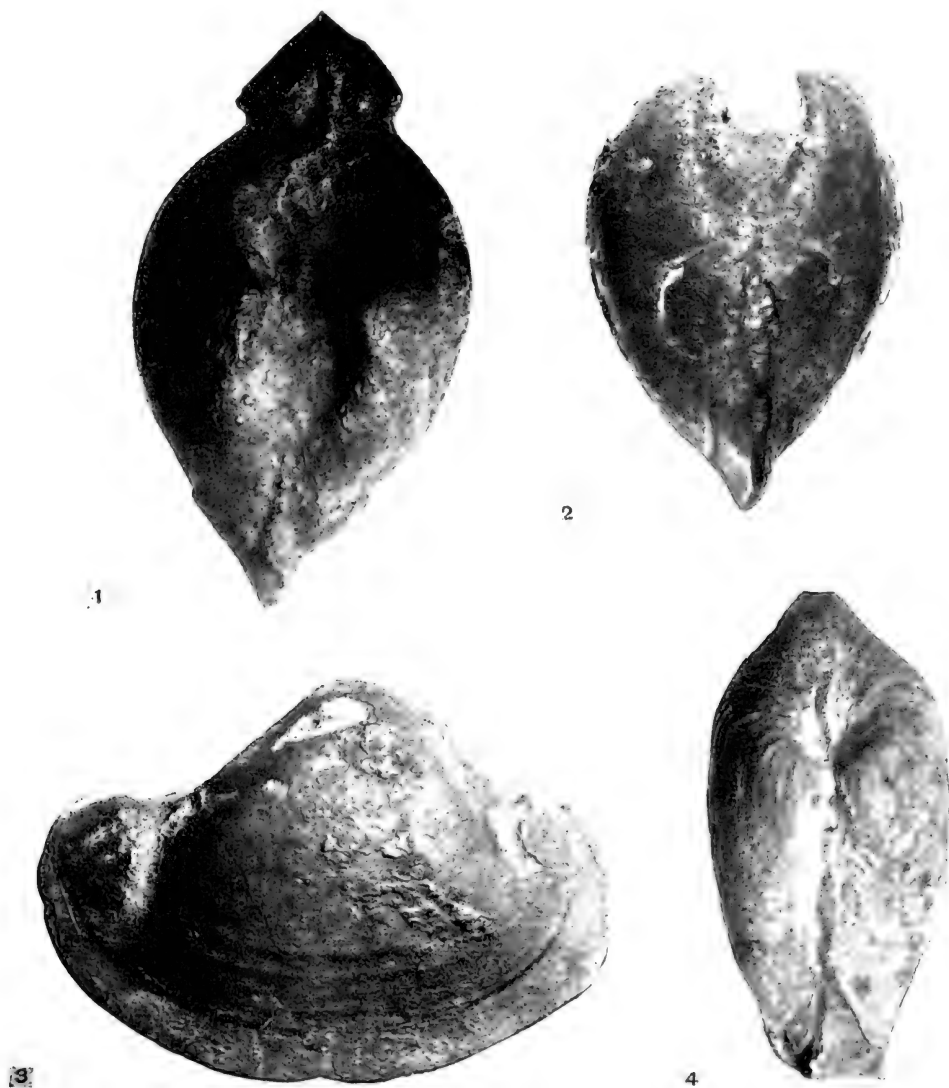
‡Clarke, Mem. 9, New York State Mus. pt. 2, 1909, p. 141, pl. 33, fig. 23.



1 and 3. *Sanguinolites albanus* sp. nov.

2, 4 and 5. *Præcardium bokkeveldense* sp. nov.





1—3. *Clenodonta grahami* sp. nov.

4. *Sanguinolites albanus* sp. nov.

New and little known South African Naiades.

By M. CONNOLLY.

[With Plates XI and XII.]

CAFFERIA CAFFRA (Krs) subsp. VERREAUXI (Charp.).

[Pl. XI, figs. 3 and 5.]

1856. *Unio verreauxi* Charp., Küst., Conch Cab., p. 150, pl. 43 (1855), f. 6.
1856. *Unio verreauxianus* Lea, Proc. Acad. Nat. Sci. Philad. VIII, p. 94.
1858. *Unio verreauxianus* Lea, Journ. Acad. Nat. Sci. Philad. III, p. 301, pl. 27, f. 16.
1891. *Unio caffer* Krs., Smith, A.M.N.H. VIII, p. 317 (Synonymy).
1891. *Unio verreauxi* (Charp., Smith, *ibid.*, p. 319).
1900. *Nodularia (Cafferia) caffer* Krs., Simpson, Proc. U.S. Nat. Mus. XXII, p. 825 (Synonymy).
1914. *Unio (Cafferia) caffer* Krs., Simpson, Deser. Cat. Naiades, p. 575 (Synonymy).

It will be seen from the above, that in 1856 Küster and Lea both described new species from material collected by Verreaux in Cape Colony; but as Küster's figure was published in 1855 the name awarded by him, which should, however, be spelled *verreauxi*, has priority.

It is by no means certain that *verreauxi* and *verreauxianus* represent the same species; in fact, judging from their figures they are probably distinct. In 1891 Smith placed *verreauxianus* in the synonymy of *caffer*, but remarked that he had never seen a shell with sufficient resemblance to Küster's figure to enable him to decide as to the specific merits of *verreauxi*, while in 1900 and 1914 Simpson placed *verreauxianus* in the synonymy of *caffer*, but made no direct reference to *verreauxi* as portrayed by the German author.

A considerable series of shells collected by R. J. Ortlepp in the Kowie River at Blaauwkrantz, near Grahamstown, and kindly submitted to me by Mr. J. Hewitt, Director of the Albany Museum, appear thoroughly representative of *verreauxi*. That is

to say that more than one of them can be superimposed on Küster's figure and found to agree with it in all but one particular, the upper anterior margin of the Blaauwkrantz shells descending in a regular curve, while in the figure it is prominently shouldered. This latter feature, however, is occasional and inconstant in the genus *Cafferia*, occurring in my own collection, in company with the normally curved form, in sets from Retreat Vlei, Cape Peninsula, and from Christiana and Crocodile River, Transvaal. The Blaauwkrantz shells may therefore, I think, be accepted as normal examples of *verreauxi*.

They differ in so many respects from what is usually accepted as typical *caffra* that they must be entitled to at least subspecific rank.

For purpose of comparison, I figure under the name of *caffra* [Pl. XI, fig. 2] a large specimen out of a series from Crocodile Drift, Limpopo River, near Pretoria, some of which have been pronounced by Dr. Haas, of Frankfurt-a-M., to be typical of Krauss' species, and I also append measurements of several examples of each form, which show the comparatively greater altitude of *verreauxi*. Other points of difference will be found on a later page.

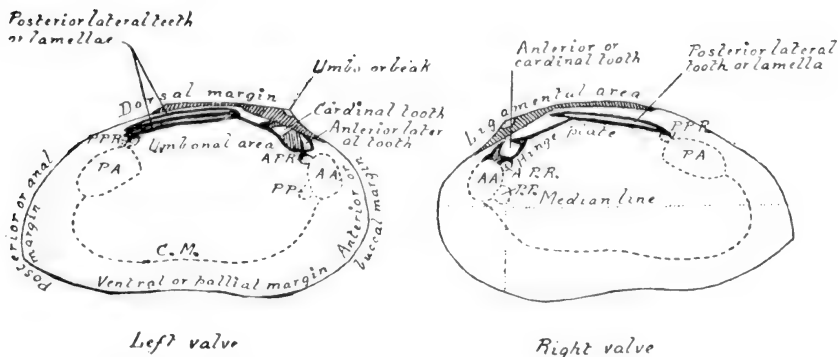
CAFFERIA CAFFRA (Krs.).

	mm.	mm.	mm.	mm.
Length from anterior to posterior margin	83	73½	74	71
Altitude from dorsal to ventral margin ..	40	38	36	37½
Thickness of double valves	27	24½	23½	23½

C. CAFFRA VERREAUXI (Charp.).

	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
Length	92½	84½	82	79½	79	76½	76	73½
Altitude	56	46	45½	45	43	43	44	43
Thickness	33	28	30½	29	25	26½	25½	27

Before proceeding further, I append a rough diagram illustrating the technical terms most usually employed in the description of a *Unio*, as the books in which such explanations have been given are not very accessible to students in South Africa.



Cafferia caffra verreauxi (Charp.) showing interior of valves.
Nearly $\frac{2}{3}$ nat. size.

- P.A. Scar of posterior adductor muscle.
 P.P.R. " " " pedal retractor muscle (sometimes lettered R.P.P.)
 A.A. " " " anterior adductor muscle.
 A.P.R. " " " pedal retractor muscle (" " " R.P.A.)
 P.P. " " " pedal protractor muscle (sometimes lettered P.P.A.)
 C.M. Pallial line, or scar of circumpallial muscle.

Another series of shells furnished by Mr. Hewitt from Bushman's River, Alicedale, C.P., differ so widely from both *caffra* and *verreauxi* that I describe them below as a new subspecies of *caffra*. I may add that I should have considered all these three forms to be specifically distinct, were it not for the opinion of so high an authority as Dr. Haas that they are conspecific.

CAFFERIA CAFFRA OBESA subsp. nov. [Pl. XII, figs. 1-4.]

Shell subovate, solid, slightly gaping in front, longitudinally compressed, transversely inflated, covered with a yellow brown periostracum; ligament normal. Dorsal margin convex, beaks very prominent; anterior border irregularly curved and steeply descending above, and evenly curved at its extremity, which is below the median line; pallial border slightly curved, usually very shallowly indented beyond half way; posterior border comparatively short, little curved above, evenly so at its extremity, which is below the median line, with hardly any trace of ridge

to the umbones. Early sculpture worn and much malleate, soon changing to close, even, concentric striation on the fore-part, becoming somewhat rugose on the hinder part of the shell; after a length of about 34 mm. it again alters to coarse concentric costulae of irregular prominence.

Interior: nacre smooth. Right valve: anterior tooth triangular $11\frac{1}{2}$ mm. at base, very strongly projecting; posterior lateral lamella comparatively short, $22\frac{1}{2}$ mm., but very prominent, strongly thickened in the rear. A.A. roughly oblong, deeply impressed, with the minute, bluntly pointed A.P.R., of equal depth, projecting from its right upper corner into the base of the anterior lamella; P.P. small, nearly square, almost superficial; P.A. fairly deep, oblong, rounded in rear; P.P.R. ovate, very small; circumpallial scar rather strongly grooved, sometimes with two or three shallower parallel grooves above it. Left valve: anterior lamella prominent and comparatively long, $10\frac{1}{2}$ mm.; posterior lateral lamellae short, 19 mm., diverging considerably to the rear.

Hab. Cape Province. Bushman's River, Alicedale (Hewitt).

Type in Albany Museum, Grahamstown.

Long 67.5; alt. max. 39.5; thickness 29.0 mm.

Four other specimens measure:—

Long 69.0; alt. max. 41.0; thickness 28.0 mm.

„ 66.5; „ „ 39.0; „ 26.0 „

„ 82.0; „ „ 48.5; „ 31.0 „

„ 87.5; „ „ 47.5; „ 33.8 „

(The two largest examples unfortunately came to hand too late for either of them to be utilised as type.)

The double shell is comparatively shorter and thicker than that of *caffra* or *verreauxi*; the anterior tooth is longer and more prominent than in those forms, and the posterior lateral lamellae much shorter, while in the left valve the latter diverge more widely to the rear and are consequently less parallel. Closer comparison of sets of the three forms yields the following results:—

In *caffra* and *verreauxi* there is a distinct point at the extremity of the posterior margin, well below the median line,

and a well marked ridge running from that point, on the exterior of the valve, toward the umbones; in *obesa* there is hardly a trace of point or ridge, and the sculpture is noticeably coarser and less even. The right cardinal tooth is weak in *caffra*, stronger in *verreauxi*, and larger and still stronger in *obesa*, while in the latter the right posterior lateral lamella is much shorter, but thicker and more prominent. In *verreauxi* the left posterior lateral lamellae are long, even and nearly parallel; in *caffra* they thicken and gape slightly to the rear, while in *obesa* they are much shorter and gape more widely. In *caffra* the A.P.R. is slightly more distinctly separated from the A.A. than in the others, and the A.A. is usually nearly square, instead of oblong. In *caffra* and *obesa* the valves gape in front, in *verreauxi* they are nearly close all round.

From these comparisons it will be seen that, although the three forms do not diverge uniformly in the same direction, certain points being common to either two which differ in the third, *obesa* differs considerably more from both *caffra* and *verreauxi* than do the latter from each other, and the Alicedale race may possibly prove, eventually, to be worthy of specific rank.

INDONAIA FRAMESI sp. n. [Pl. XI, figs. 1 and 4.]

The new species about to be described was submitted several years ago by Mr. H. C. Burnup to Dr. Haas, with a view to its inclusion in his forthcoming Monograph of the *Unionidae*. Owing, however, to delay in the publication of this great work, Dr. Haas has kindly suggested that I should describe it forthwith, and I am indebted to him for determination of its generic position and for his decision that it is distinct from all other members of the genus.

Indonaia was established in 1918 by Dr. Prashad for the Indian species *Nodularia coerulea*, but both that author and Dr. Haas agree that it is applicable to the South African group which includes *mossambicensis* Peters, *victoriae* Preston, and *kunensis* Mousson.

Shell rather thin, irregular trigonal, valves gaping very slightly in front, broad and inflated in comparison to its length,

covered with a blackish brown periostracum; ligament strong, bright brown, 16 mm. long. Dorsal margin nearly straight, beaks not prominent; anterior margin evenly curved, maximum point just below median; pallial border in the type and majority of specimens nearly straight; posterior margin evenly curved, maximum point nearly median, with no ridge therefrom to the umbones. Umbonal sculpture too worn for description, but when first visible, after the young shell having attained a length of 14 mm., consisting of very close, fine concentric striae, with four or five prominent growth lines at irregular intervals, on all of which are superimposed coarse transverse costae, which make a zigzag pattern towards the rear; when the growing shell is about 32 mm. in length, the sculpture changes abruptly to coarse, fairly regular, concentric costae, closer together in front than behind, with traces of finer concentric striae in the intervals between them. Interior: nacre smooth and pearly, sometimes pinkish. Right valve: cardinal tooth rather long, 8.25 mm., moderately strong, jagged; posterior lateral lamella slightly curved, narrow and not prominent, 21.75 mm. in total length. A.A. deep, nearly square; A.P.R. a mere point sloping upward from its right upper corner on the surface of the anterior lamella; P.P. extremely small and shallow; P.A. suboval, of moderate depth; P.P.R. a minute, almost superficial, triangle; circumpallial scar very weak. In the left valve the anterior lamellae are weak and the posterior lateral lamellae almost parallel, diverging but slightly to the rear.

Long. 53.0; alt. max. 31.2; thickness 22.5 mm.

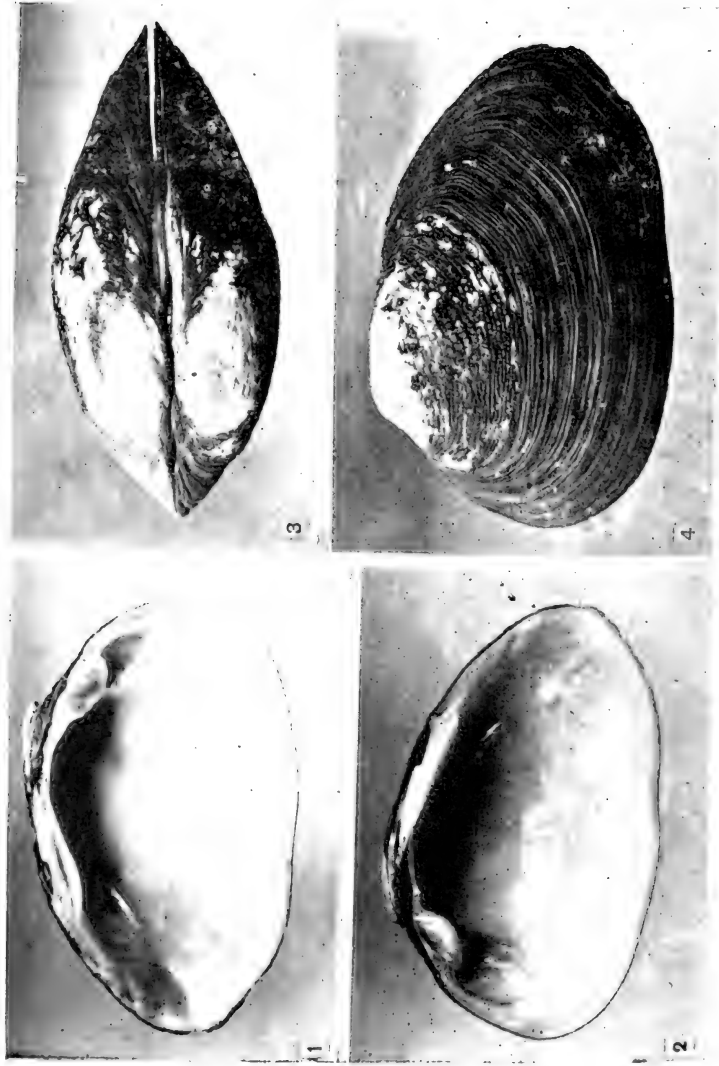
Two other specimens measure:—

52.5; alt. max. 32.0; thickness 22.8 mm.

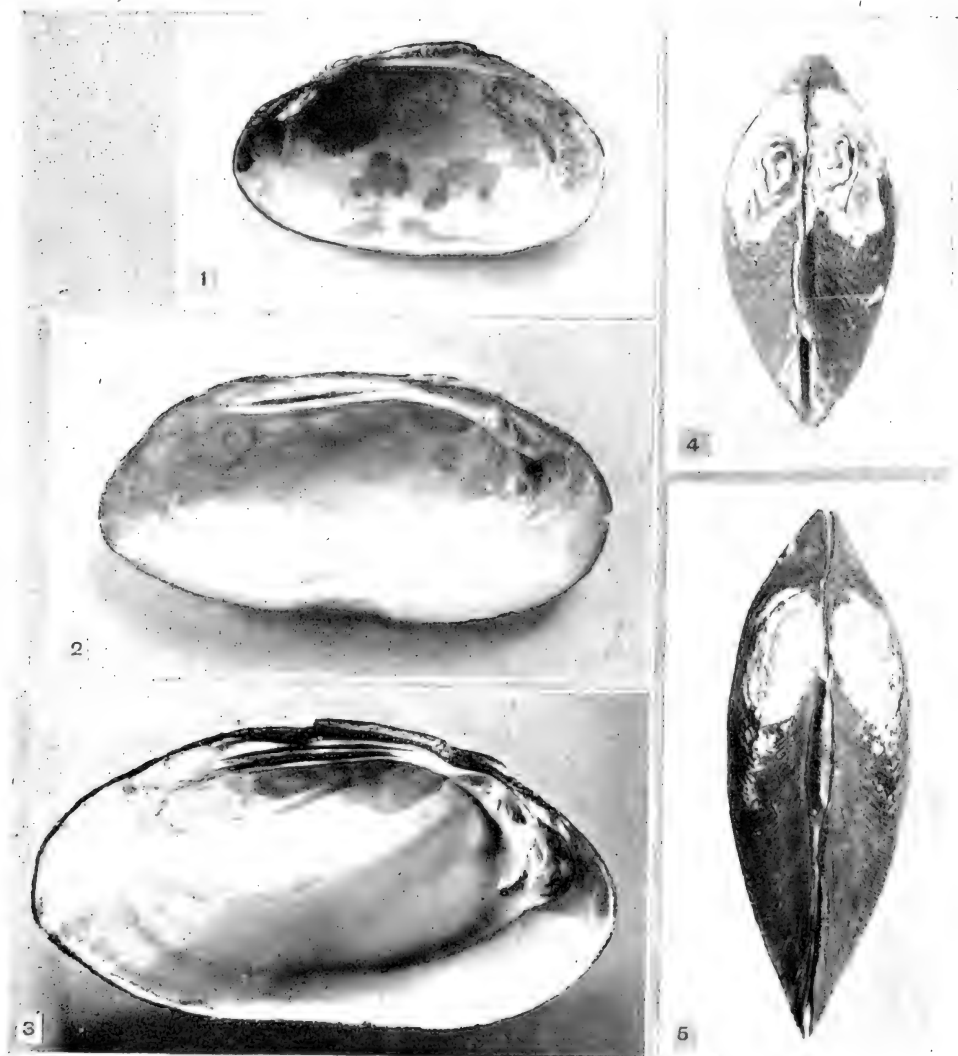
50.25; alt. max. 28.5; thickness 21.0 mm.

Hab. Transvaal. Near Premier Mine, Pretoria District (P. Ross Frames). Type in Senckenberg Museum, Frankfurt-am-Main.

The shell is larger and longer in proportion to its altitude, than either of its South African confrères already mentioned, so that no detailed comparison is necessary, and the same remark applies to its relations with *I. cronini* (Walker) and *ellenbergeri* (Germain), both recently described from Northern Rhodesia.



Casseria calfra obesa subsp. nov.



1 and 4. *Indonaia framesi* sp. nov.

2. *Cafferia caffra* (Krs.)

3 and 5. *Cafferia caffra verreauxi* (Charp.)

I have been unable to compare it with actual examples of the multitude of so-called species described from further north by Bourguignat, Charmes and others, but rely on Dr. Haas' judgment that it is distinct from all of them.

In addition to those already mentioned, the author's thanks are due to Messrs. B. B. Woodward, Paul Pallary, Bryant Walker and W. B. Marshall for kind assistance in the preparation of this paper.

EXPLANATION OF PLATES.

- Pl. XI. *Indonaia framesi* sp. nov., figs. 1 and 4.
Cafferia caffra Krs., fig. 2.
Cafferia caffra verreauxi (Charp.), figs. 3 and 5.
- Pl. XII. *Cafferia caffra obesa* subsp. nov., figs. 1-4.

***Some New or Little Known Species of Hemiptera
from Grahamstown, S. Africa.**

By W. E. CHINA, B.A.

Through the kindness of Mr. J. Hewitt, I have been able to describe the following new or little known species of Hemiptera collected in the Grahamstown district. The type specimens of the new species have been presented to the British Museum.

HETEROPTERA.

Family LYGAEIDAE.

Subfamily *Rhyparochrominae*. Tribe *Lethacini*.

Genus *Gonatas* Dist.

Biologia Centr. Americana Hemipt. Heteropt I, p. 219.

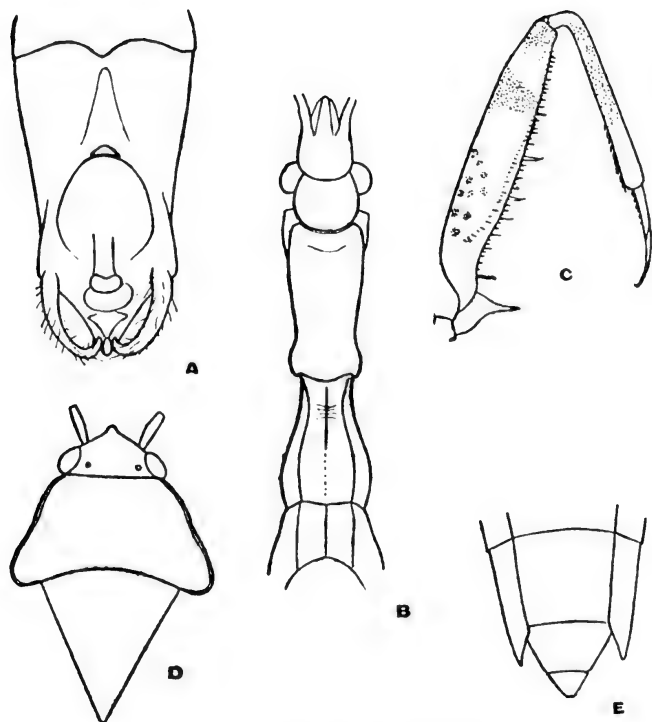
Gonatas natalensis Dist.

Ann. Mag. Nat. Hist. (9), II, p. 270 (1918).

(Text fig. D.)

Redescription: Oblong with head and pronotum moderately depressed. Head shining black, distinctly and regularly punctate above, more densely and deeply so below; triangular, as long in the middle as wide at the base between the eyes, distinctly wider with the eyes than the anterior margin of the pronotum; rostrum extending to the intermediate coxae, pale ochraceous with the tip black; antennae pale ochraceous, clothed with long and short hairs, the basal joint extending by half its length beyond the apex of the head, second twice as long as the first, third subequal to the second, fourth slightly shorter than the third. Pronotum smooth and shining, regularly punctate, the punctations slightly coarser on the disc and more obscure over the pronotal cicatrices, disc slightly depressed; lateral margins slightly concavely sinuate in the middle, very narrowly carinate, the carina of equal width throughout its length; posterior margin broadly emarginate above the scutellum; anterior margin rather less than one half the width at base; two-thirds wider at the base than long in the middle; anterior lobe black, the posterior lobe pale ochraceous with the punctations black and an obscure median dark area

^c(Published by permission of the Trustees, British Museum)



- A.—Genital segment of male *Ploiaria hewitti* sp. nov.
 B.—Head pro- and meso-notum of same.
 C.—Anterior femur and tibia of same.
 D.—Head, pronotum and scutellum of *Gonatas natalensis* Dist.
 E.—Dorsal view of ultimate abdominal segments of *Gerris capensis* sp. nov. female.

extending from the anterior lobe almost to the posterior margin. Pro-, meso-, and meta-sterna shining black and deeply punctate except the posterior lateral angle of the prosternum, which together with the acetabulae is pale ochraceous and impunctate. Scutellum shining black, one-third longer than wide at base, the disc elevated but with a slight depression in its centre, the lateral margins flattened, disc finely punctate on the basal two-thirds, flattened lateral margins more coarsely punctate. Hemelytra

extending well beyond the apex of the abdomen, completely hyaline, clavus with three rows of punctures, corium with one row of punctures immediately without the claval suture, and two others one on each side of the disc which is itself sparsely punctate; the punctures and the outer posterior margin of the corium narrowly brown, costal margin moderately ampliate on its apical two-thirds; membrane together with its nervures completely colourless and translucent, the transverse vein connecting the three exterior longitudinal veins absent. Abdomen above and below shining black, impunctate; glandular spots each giving rise to a long bristle-like hair, the two on the third apparent ventrite placed close together and remote from the posterior margin; the third apparent ventrite laterally, particularly in the male, slightly rastrate. Legs pale ochraceous, anterior femora feebly incrassate, in the female armed with two feeble black spines towards the apex; in the male unarmed; tibiae armed with a few irregular bristles; basal joint of posterior tarsus twice as long as the apical two together. Posterior margin of the pygofer in the male produced in the middle into a long spur directed vertically upwards. Total length including membrane; female 4.8 mm., male 4.1 mm. Width across base of pronotum; female 1.7 mm., male 1.3 mm.

South Africa. Howieson's Poort, near Grahamstown. (J. Hewitt, 13.9.1924.) 1 male and 2 females.

Distant's description of this species was founded on a single imperfect specimen collected at Durban.

Family REDUVIIDAE.

Subfamily Emesinae.

Genus *Ploiaria* Scop.

Scopoli, Deliciae faun. et. flor. insubricae I, p. 60 (1786); *Cerascopus* Heinek Zool. Journ., p. 36 (1830); *Emesodema* Spinola, Essai, p. 87 (1837).

Genotype: *P. domestica* Scop.

PLOIARIA HEWITTI. sp. nov. (Text fig. A. B and C.)

Dark chestnut brown with obscure ochraceous markings, the surface dull and very finely rugose.

Head without spines, dark castaneous, a median fascia extending down both lobes, a small elongate area below the base of each antenna and two lateral fasciae one on each side of the posterior lobe of the head extending from the inner margin of the eye and converging towards the posterior margin, dirty yellow; eyes dark, granulate; rostrum castaneous, the second joint a little longer than the first, with its basal half pale, extending to the middle of the eyes, apical joint about one half longer than the second, its base pale; antennae pale castaneous, basal joint about as long as the metanotum and abdomen together, its apex pale, second joint a little shorter than the first, its extreme apex pale, third joint about as long as the pronotum, apical joint slightly shorter than the third. Pronotum one-seventh longer than the head, dark castaneous with an obscure median fascia more distinct anteriorly and the basal angles pale; mesonotum as long as the head, dark castaneous, the lateral carinae and various obscure markings pale, metanotum rather less than half the length of the mesonotum, dark castaneous, the lateral carinae anteriorly and various obscure markings pale. Hemelytra and wings absent. Abdomen dark castaneous with a median longitudinal fascia anteriorly and various lateral blotches pale ochraceous. In the male is a series of yellowish wart-like tubercles placed on the connexivum, each one situated in the middle of the lateral margin of each segment. Underside pale greyish ochraceous with a median carina commencing half-way down the mesosternum and extending on to the base of the abdomen, highest on the metasternum. Anterior coxae a little longer than the pronotum, pale ochraceous with a dark brown area above towards the apex; anterior trochanters each with a very strong pale yellow spine, directed downwards, with the tip black, also with a fine black spine on the inner side directed inwards; anterior femora not quite twice as long as the coxae, ochraceous, with the apex, a broad annulation below the apex and numerous spots on the basal half, dark castaneous; below with two rows of spines, the outer row extending the whole length of the femur and composed of five or six large yellow spines with black tips and numerous smaller blackish ones,

the inner row curving upwards before reaching the base of the femur, composed of numerous irregular sized dark spines; anterior tibiae three-fifths the length of the femora, ochraceous, with the apex and the basal half castaneous, armed below towards the apex with thick, depressed, bristle-like hairs; anterior tarsi slightly more than half the length of the tibiae, triarticulate, the basal joint longest, nearly as long as the other two together, pale ochraceous and armed below with a row of depressed bristles, remaining joints brown, the apical one terminated by a single curved claw. Intermediate femora about as long as mesonotum, metanotum and abdomen together, greyish ochraceous, with the apex and an annulation below the apex dark castaneous, area between apex and annulation white; intermediate tibiae greyish ochraceous, with the extreme base and an annulation above the base dark castaneous, the area between base and annulation pale. Posterior femora about as long as head, thorax and abdomen together, similar in colour to the intermediate femora but with the apex entirely white; posterior tibiae similar in colour to intermediate tibiae. Pygofer in the male elongated, posterior margin in the middle produced into a short spur-like process, the lateral margins each with a long recurved style, the apices of the styles practically contiguous with the apex of the central spur. Total length 9.5 mm., length of pronotum 1.5 mm.

S. Africa, Grahamstown (J. Hewitt), 1 male and 2 females.

"Very common under large stones on the flats."

Since this description was written, Mr. Hewitt has sent me a winged male which differs considerably from the wingless form, and is here described:

Very similar in colour to the apterous form, but differing in the presence of wings, structure of the thorax, and size of the eyes.

Eyes large and prominent, width of head between the eyes less than one half wider than the diameter of an eye, whereas in the apterous form it is three times the diameter of an eye; posterior lobe dark fuscous with the pale markings obsolete; antennae with the first two joints covered with long, erect, fine hairs, much more so than in the wingless male. Pronotum only

slightly longer than the head, and distinctly narrower than its width across the eyes; more or less arcuately ridged before the posterior margin, in front of this ridge slightly constricted. Mesonotum one-third longer than the pronotum, and one-third longer than the width posteriorly; posterior margin shallowly trisinuate, one and a half times as wide as the anterior margin; strongly convex above, the lateral margins carinate, disc in the middle finely but distinctly sulcate; fuscous with the lateral carinae whitish. Scutellum small unarmed. Hemelytra extending well beyond the genital segment, pale fuscous, obscurely variegated with a darker shade; veins pale except the innermost vein of the corium and the outer vein and apex of the basal membranal cell, which are dark fuscous.

"Found under the same stones as the wingless form but not noticed until the commencement of summer."

Jeannel in his key to the African genera of *Emesinae* (Voy. Alluaud et Jeannel en Afr. Orient 1911-12, Hémiptères III, p. 149-150, 1919), places the genus *Ploiaria* Scop. under the section with unarticulate anterior tarsi. As Dr. G. Teodora* has shown however, the anterior tarsus in the genotype *P. domestica* Scop. is triarticulate and is armed with a pair of unequal claws. In the present species, the triarticulate anterior tarsus is terminated by a single claw. This very distinct species is apparently the first *Ploiaria* to be described from South Africa.

Family GERRIDAE.

Genus *Gerris* F.

Subgenus *Gerris* Latr.

Horvath Ann. Mus. Nat. Hung. 5, p. 307 (1907). *Limnotrechus* Stal, Öfv. Vet. Ak. Förh. 1868, p. 395.

GERRIS CAPENSIS sp. nov. [Text fig. E.]

Apterous, female. Robust, dull, sericerous, dark rufo-fuscous above, whitish below. Head dark fuscous above with a few long, dark hairs, two lateral fasciae converging slightly towards the base and fusing with a transverse band lying along the posterior

* Rodia XIV, p. 45 (1921).

margin and a blotch adjoining the inner anterior margin of each eye, bright yellow; the dark area between the two lateral yellow lines is glabrous and shining, but the rest of the head is dull and sericeous; underside pale yellow with a longitudinal patch of rather long, pale hairs; antenniferous tubercles and antennae black, the latter as long as from the apex of the head to the posterior coxae; first joint longest, second joint a little more than half the length of the first, the third subequal to the second, the fourth about two-thirds the length of the first; rostrum pale yellow with the apical joint and the apex of the third, black; third joint longest, reaching to the posterior margin of the prosternum, the fourth extending shortly on to the mesosternum.

Pronotum and scutellum dull sericeous, dark rufo-fuscous above with a median longitudinal line and the lateral and posterior margins of scutellum narrowly yellow; lateral margins of the pronotum behind the eyes with a broad band of silvery pubescence: prosternum pale yellow with a black spot on the outer side of each acetabulum. Mesosternum with the upper margins adjoining the scutellum dark fuscous with a broad band of silvery pubescence (continued from the pronotum), down the middle; below whitish changing to yellow towards the dark upper margins, the base of the acetabular suture and a longitudinal blotch on the outer side of the acetabulum black. Metanotum dark fuscous with an obscure median longitudinal line yellow; metasternum below whitish with the upper margin adjoining metanotum black with a longitudinal patch of silvery pubescence; outer side of acetabulum black. Abdomen above black with an obscure narrow median longitudinal line and the connexivum obscurely yellow; the third to the sixth sternites with a greyish pubescence in the anterior lateral angles; the posterior lateral angles of the sixth sternite sharply pointed but feebly produced, not reaching the posterior margin of the seventh sternite; underside whitish changing to yellow towards the sides with a broad black vitta along each lateral margin below the connexivum, narrowing posteriorly. Anterior femora ochraceous with two fuscous stripes on the apical two thirds, one above and

one below; anterior tibiae fuscous with the tarsi black; basal joint of tarsus about two-thirds the length of the apical joint which is armed with two claws placed below the apex. Intermediate and posterior legs pale fuscous with the tibiae and tarsi darker, the intermediate femora as long as the thorax and abdomen together, tibiae rather shorter, tarsus about three-sevenths the length of tibiae. Posterior femora very slightly shorter than the intermediate femora, posterior tibiae five-eighths the length of the femora, tarsus two-fifths the length of the tibiae. Total length 11 mm., length of pronotum and scutellum, 4 mm.

South Africa, Howieson's Poort, near Grahamstown (J. Hewitt), 2 females.

Closely allied to *Gerris hypoleuca* Gerst. from Zanzibar, and possibly the apterous form of that species. Other specimens in the British Museum collection from Natal (Bell Marley) and Transvaal (Swierstra).

HOMOPTERA.

Family CICAIDAE.

Genus *Quintilia*.

Tibicen subgen. *Quintilia* Stål, Hemipt. Afr. IV, p. 28 (1866).
Quintilia Karsch, Berl. ent. Zeitschr. XXXV, pp. 111 and 116 (1890).

QUINTILIA WALKERI sp. nov.

Male. Head black with a scattered golden yellow, scale-like pubescence and numerous long, shaggy, dark hairs; a small elongate spot on the lateral margins of frontal lobe and a small obscure median spot in the middle of the posterior margin of the vertex, ochraceous. Pronotum and mesonotum black with the pubescence similar to that on the head but with the shaggy hairs longer and paler on the mesonotum; posterior lateral margins of the pronotum, the posterior margin of the mesonotum on each side, and an obscure spot at the base of each anterior ridge of the cruciform elevation, ochraceous; two small pear-shaped spots on the disc of the mesonotum, white. Sternum black, covered with long, shaggy hairs, the propleura and opercula pale yellow.

Abdomen pale ochraceous with the dorsal ventrites (widely towards the base of the abdomen and medianly towards the apex), black; the pale yellow coloration invading the dorsal ventrites from below leaves a large black spot towards the lateral margin of each ventrite, which on the basal ventrites remains connected with the main dorsal black stripe; below there is a row of small black dots down each side of the abdomen; ultimate segment black, valve pale yellow with a fuscous spot above towards the apex and covered with dark, bristle-like hairs; uncus narrow, tongue-shaped when viewed end on, black with a median pale vitta. Femora black with the apices of the middle and hind ones above, yellow; tibiae pale yellow, the extreme bases of the hind and middle ones, the apex of the middle and the base and apical half of the anterior ones, fuscous. Tarsi black with the basal halves of joints yellow. Tegmina hyaline, immaculate, with the nervures brown except the posterior half of the arculus, the cubital nervure up to the post discal nervule, the median sector beyond the corial-fold and up to the branching of M.3 and M.4, the median nervure beyond the corial-fold and up to the branching of M.1 and M.2, the base of R.3 and the basal third of the anal and brachial nervures, whitish; corial-fold very distinct, the basal third of the tegmen suffused with yellow, the costal margin up to the corial-fold ochraceous. Total length 21.5 mm. Expansion of tegmina 48 mm.

South Africa, Grahamstown (Edward Walker, 17.3.1921), 2 females.

Allied to *Q. carinata* Thunb., but readily distinguished by the black head and thorax and the pale underside of the abdomen.

Descriptions of some African Arachnida.

By JOHN HEWITT.

(With Plate XIII.)

ORDER ARANEAE.

Family MIGIDAE.

MOGGRIDGEA ALBIMACULATA sp. nov. *Types*, two female specimens found on a tree at Sekororo, about 35 miles S.S.W. of Leydsdorp, Transvaal, collected by Mr. G. P. F. van Dam, Dec., 1922.

In the spinulation of the legs this species has resemblance to *dyeri*, an arboreal species which is fairly widespread in the Eastern districts of the Cape. But the fovea character is very distinctive, being quite unlike that of any other known species: the presence of stiff hairs on patella III inferiorly is also a peculiarity.

Legs: coxa I, II, and III, with a small basal patch of stout spinules ventrally, III with only 6-8, I with 3-5, and II with about 15. Patella IV with a superoanterior band of stiffish setae but no spines; III with a stout spine on the distal edge anteriorly. Patellae of all the legs with an oblique row of peculiar long, stiff hairs inferiorly. Metatarsus IV with 2 or 3 spiniform setae in the infero-posterior apical tuft.

Labium with about 30 spinules. *Pedipalp* with about 27-33 spinules on the coxa inferiorly. *Sternum* with a pair of rounded sigilla, about a diameter apart.

Carapace: anterior margins of anterior row of eyes in a distinctly procurved line, the laterals a little larger than the medians, and distance therefrom about one and two-third times the diameter of the median, the medians being about four-fifths of a diameter apart. Posterior row of eyes in a strongly recurved line. The anterior row is well removed from the front margin of

the carapace, the distance of an anterior lateral therefrom being about one and a half diameters. The width of the ocular area does not greatly exceed that of the fovea. The fovea is conspicuous owing to the absence of pigment, forming a transversely elongated white patch a little behind the middle of the carapace. It is broader than usual in this genus, and instead of a Λ -shaped groove, there is an oblique linear groove on each side which fails to meet its fellow mesially, being separated therefrom by a distance approximately equal to the length of either one: a short shallow mesial grooved line is also present, representing the mesial prolongation of the fovea in such a species as *breyeri* mihi.

Colour: carapace and appendages dark brown, the legs paler at the joints, and the carapace with white fovea patch. Abdomen strongly infuscated.

Measurements: length of carapace 5.75, breadth of carapace 4.75.

MOGGRIDGEA PAUCISPINA Hwtt.

(Ann. Transvaal Mus. V, p. 205, 1916.)

The patella of the third leg is devoid of modified setae such as occur on patellae I, II and IV inferiorly.

In a large specimen from Selekaats Nek, Pretoria district, collected by Mr. G. van Dam, the anterior lateral eyes are scarcely larger than the anterior medians, but in half-grown specimens, the former are relatively much larger.

To this species I also refer some large specimens from the Barberton and Zoutpansberg districts, as follows:—

Sekororo, 38 miles S.S.W. of Leydsdorp, December, 1922, G. van Dam, found in moss under the side of a stone; this specimen, which is accompanied by a number of newly hatched young, has large anterior lateral eyes, the area thereof being at least three times that of the anterior medians.

Another specimen from the same site, accompanied by an

egg-sack containing numerous young, has anterior laterals which are probably four times the area of the medians.

A specimen from Barberton, March, 1920 (G. van Dam), from "nest on rocks," is similar in ocular characters to the one last mentioned: it is adult, being accompanied by numerous young.

Thus, in this species it seems probable that a number of distinct varieties are recognisable on the varying size of the anterior lateral eyes. A more constant feature of the ocular arrangement is the wide separation of anterior medians and anterior laterals, the intervening distance being equal to about three times the diameter of the former, whereas in the related species from the Cape Province, *coegensis* and *seticoxa*, the inter-ocular distance is only twice the diameter of a median.

Family CTENIZIDAE.

ACANTHODON VANDAMI sp. nov. [Text fig. I, 4 and 5.]

Types. A male and female specimen collected at Barberton, October, 1922, by Mr. G. P. F. van Dam. The species is related to *A. crudeni* mihi, from Alicedale, and *A. nigropilosus* mihi from Carolina district. It may be distinguished from both on the characters of the first leg of the adult male, and also on the ocular characters in both sexes. The male tarsi also are much more spinous in *vandami*.

Male. Appendages very pale brown; carapace pale with a reddish tinge, the ocular region infuscated; abdomen purplish above; spinners almost white; lower surfaces pale, with some infuscation on the sternum.

Palp: the tibia is about twice as long as deep, the excavation being bordered by a strip of spinules scarcely interrupted in the middle, about 19-25 basally and 6 distally. Tarsus without strong spines above.

Chelicera: a single series of teeth, with one long tooth near its base on the inner side, the single series comprising four or five of moderate size and about three small ones basally.

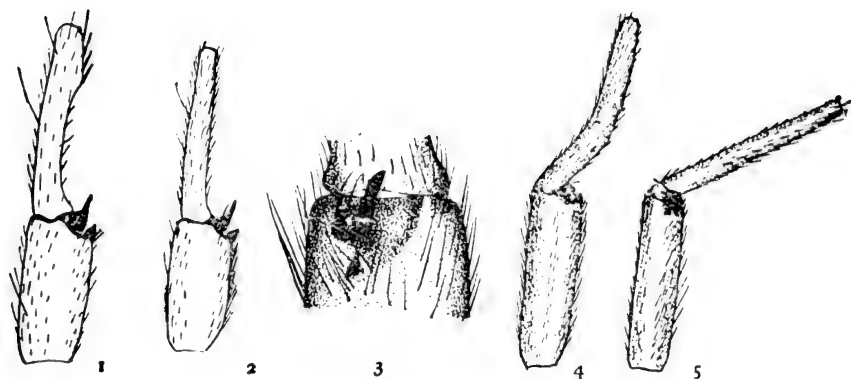
Legs: tibia I a little shorter than metatarsus I, not much

swollen, the two apical tubercles large, close together, the distal one with a short, black, pointed process at its apex, and the other definitely pointed with triangular outline in side view. On its outer side ventrally, tibia I has a row of four or five weak spines, but no other spines on the segment. In side view metatarsus I is not bowed, but viewed from above there is a well-marked angular bend at about two-fifths of its length from the base, and along the inner side of the segment a strip of about 11 or 12 weak spines extends from the bend to the distal end of the segment: along the outer side of the segment ventrally there are about five weak spines two of which being proximal to the bend. Tarsus I with a strip of about 14 weak spines on the anterior side and about the same number on the posterior side: inferiorly are six or seven spinules but no scopula. Tarsi II-IV scopulate to the base and well spined on each side. Band of spinules on anterior side of patella IV only present in the basal half of the segment, and comprising about 11 spinules. Patella III with about nine spinules on the anterior side but none dorsally.

Carapace: the length of the ocular area very slightly exceeds one-third of the distance from the centre of the fovea to the anterior margin of the carapace. Frontal eyes about one-fifth of a diameter apart, the frontals considerably larger than the anterior medians: posterior margins of posterior row in a very slightly procurved line. Seen from above, the anterior margin of the carapace is not a straight line, the frontal region projecting a little.

Measurements: length of carapace 4.9, of tibia of first leg 3.8, of metatarsus of first leg 4.

The chief characters of the adult female are as follows:—*Sternal sigilla*, two pairs: first pair marginal. *Legs*: coxa III with setae along the post-ventral border but not forming a dense tuft. Tibia II with about nine spines on its anterior side. Patella IV with the band of spines on the anterior side stretching practically the whole length of the segment. Tibia IV with one or two weak spines on the lower portion of the anterior surface.



Text figure 1.

Tibia and metatarsus of left leg I in adult male of

1. *Acanthodon schreineri minor* Hewitt, dorsal view from mesial side
2. *A. sylvestris* sp. nov. type specimen
3. Same, shewing the two processes at distal end of tibia I
4. *A. vandami* sp. nov. in dorsal view
5. Same, seen from inner side

Chelicera: with a single row of seven teeth, of which the two basal ones are minute, and, in addition, a single rather large internal tooth opposite the two basal ones of the series.

Ocular area: very slightly exceeding one-third of the distance from the anterior margin of carapace to the centre of the fovea: frontal eyes distinctly projecting, frontal quadrangle a little broader anteriorly, the frontal eyes being very large though sub-contiguous. Hind margins of posterior row in a slightly recurved line: front margins of anterior medians and of posterior laterals also in a slightly recurved line: posterior medians only a trifle nearer to the laterals than to each other. The pair of long setae behind the ocular area is decidedly nearer to the anterior margins of the anterior medians than to the centre of the fovea. General colouration olive brown, the hind pair of legs distinctly paler, being yellowish.

Length of carapace 5.65, breadth of carapace 4.75.

In a smaller specimen, also from Barberton, the hind margins of the posterior row of eyes are practically in a straight line, and the ocular area is subequal in length to one-third of the distance from the anterior margin of the carapace to the centre of the fovea.

ACANTHODON SYLVESTRIS sp. nov. [Text fig. I, 2 and 3.]

Type: a single male example, found running about on the ground in the Woodbush, December, 1922, by Mr. A. Roberts. The species is probably related to *A. paucispinulosus* mihi, the type of which came from Gravelotte, near Leydsdorp, but of which only female examples are known. It is closely related to *A. schreineri minor* from the Pretoria district, and perhaps to *A. monticola* from the same district: the former differs in having a distinct bend in metatarsus I, and the latter in the absence of spinules on Coxa III.

Sternum with three pairs of sigilla, the first submarginal. *Chelicerae*, with an inner row of four strong teeth, near the base of which on its outer side, is a series of three teeth, the basal one smallest (or four on one side, but the distal one is very minute).

Pedipalp. The excavation of the tibia is bordered by a continuous strip of spinules, numbering altogether about 29. Tarsus with one strong spine, and two or three weaker ones at the apex. *Legs*. Coxa III with a well-defined strip of short, stiff, weakly spinuliform setae densely arranged along the post-ventral border over the basal half of the segment: in the distal half, the strip as such disappears, the individual setae becoming fewer and more scattered, and some of them elongated. Coxa II has indications of such a strip basally but none of the setae are even sub-spinuliform.

Tibia I much stouter than the metatarsus and stouter than the patella, decidedly shorter than the metatarsus, its distal tubercle bearing a long, bluntly pointed process: the other tubercle is subtriangular, with pointed apex: on the outer side

inferiorly three long spiniform setae (or four, the proximal one being least developed). Metatarsus I not quite straight either in dorsal view or laterally, but there is no distinct bend in its course nor is it plainly arched: internally it has a spine at the apex and a few stiff setae along the inner side: on the outer side inferiorly are three or four long spiniform setae and a distinct spine at the apex. Tarsus I without spines. All the tarsi are scopulate, IV without stiff setae in the scopula. Patella IV with about 21 spinules anteriorly, extending over the basal half of the segment: III with about 11-14 spinules on its anterior side, including those on the distal edge, but none on the dorsal surface.

Ocular area. Frontal eyes only slightly raised on a separate tubercle, about one-third diameter apart, the frontal quadrangle decidedly broader behind, the anterior medians being larger than the frontals. Posterior medians nearly two diameters apart, and about a diameter distant from the posterior laterals.

Colour: carapace and appendages dark brown above; tarsus and metatarsus of legs I and II paler; abdomen blackish brown. Lower surfaces of appendages olive; sternum, genital region, lung opercula, and spinners yellowish.

Measurements: length of carapace 4, breadth of carapace 3.7, length of tibia I 2.75, of metatarsus I 2.9.

GALEOSOMA VANDAMI Hewitt.

[Ann. Transvaal Mus. V, p. 95, 1915.]

[Text fig. II, 1.]

A series of female examples of this species was taken by Mr. G. van Dam at Wilhamshohe, near Blauwberg, in the Zoutpansberg district, 27.8.1923, and along with them two adult males. The characters of the latter are as follows—

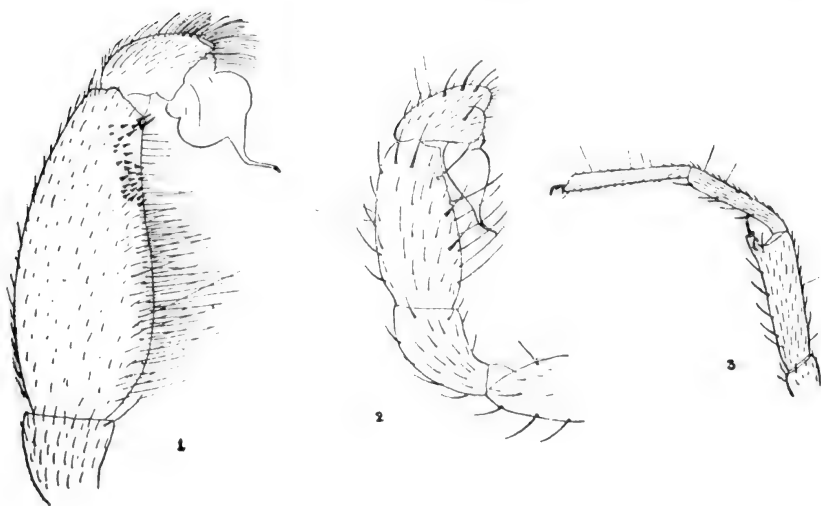
Ocular area. The posterior group of six eyes is raised on a low, broad eminence, which is sharply defined posteriorly. Frontal eyes slightly projecting, so that the anterior margin of the carapace is not quite straight. Frontal quadrangle much broader behind.

Legs. Tarsus I with long hairs inferiorly, but not scopulate except near the apex: II with a weak scopula, III and IV well scopulate. Metatarsus I slender and practically straight, with two or three spines on the posterior side and, in addition, both anteriorly and posteriorly a series of strong bristles or spiniform setae. Tibia I thickly clothed with spiniform setae inferiorly and laterally, and with a row of five spines inferiorly on the posterior side: this segment is a little longer and thicker than the metatarsus. Patellae III and IV with spinules on the anterior surface, III about 14 extending over the whole length of the segment, IV in the basal half only.

Pedipalp. The tibia is not so elongated as in *pilosum* (see "Records Albany Museum" III, p. 207). The excavation on the outer surface is obsolete, but the cluster of spines and spinules is well developed: there are four strong spines in front, a posterior cluster of about 20 spinules, and connecting the two about five or six spinules. Tarsus with one or two spines distally and a few spiniform setae. Spine of bulbal organ a short, twisted, more or less flattened filament, terminating abruptly.

Abdomen. In its posterior half, the abdomen has much the same shape as in the female. The margins of the undeveloped shield between upper and lateral surfaces are in fact quite well defined, but the integument is pale and soft, like that in the anterior part of the abdomen. Upper surface of "shield" with rather long, stiff setae sparsely arranged, the circular edge marked by a ring of such setae. Sides of shield anteriorly with numerous smaller setae; posteriorly and laterally with very few setae. Elsewhere, the abdomen is densely clothed with short, fine hairs arranged in parallel transverse lines. There is a pair of sigilla in the hinder part of the upper surface of the shield: in one specimen, the sigillum is a triple scar.

Sternum, with three pairs of sigilla, the first marginal, the second slightly removed from the margin, third minute and well removed from the margin. Total length 11, length of carapace 5.2, breadth of carapace 4.2, length of metatarsus I 3.8, of tibia I 4.2.



Text figure II.

1. *Galeosoma vandami* Hwtt. Palp of adult male
2. *Microstigma geophilum* Hwtt. Inner surface of palp of adult male
3. Distal segments of first leg of same, outer or posterior surface

With one of the males, Mr. van Dam found the cast skin of a small but otherwise typical *Galeosoma*. This is presumably the skin of the young male, as cast off at the moult preceding sexual maturity. Assuming that the shield of this genus is an adaptation character, connected with a tubicolous habit, it is interesting to notice that the essential structure still remains when the fully developed shield is no longer required. It might have been anticipated that the abdomen of a male *Galeosoma* would prove to be like that of *Acanthodon*, for in many genera (cp. *Stasimopus*) the adaptation characters common to females and young males completely disappear at the final moult of the male. Except for this unique structure, *Galeosoma* is evidently a primitive form. No other Idiopine genus is known to have so little specialisation in the males. The dentition of the chelicerae, and the tri-sigillate sternum, are also primitive characters apparently.

STASIMOPUS NIGELLUS Poc.

[Ann. Mag. Nat. Hist. 7, X, p. 319, 1902.]

A male of this species, and a rather small female with young, presumably belonging thereto, have been taken at Potchefstroom by Rev. Noel Roberts. I have previously recorded the species, on the evidence of males, from Venterskroon, females from that locality being much like that described by me from Kroonstad under the name of *dreyeri*. The Potchefstroom female has also much in common with *dreyeri*, but differs considerably from *S. dubius* mihi which was founded on a single female also from Potchefstroom and which seems very near to the Pretoria species *S. robertsi*. In the specimen before me from Potchefstroom, the patch of spinules on the upper surface of metatarsus I extends one-third of the length of the segment, and is quite thrice as long as the patch at apex of tibia I. There are several spinules at apex of palpal tibia, and the basal patch on the palpal tarsus is short, extending about one-seventh the length of the segment.

I am therefore satisfied that two species occur at Potchefstroom: and this may also be the case at Pretoria, for I have seen a specimen from Wonderboom, Pretoria (Transvaal Mus. Coll.), in which the patches of spinules on the palpal tarsi and on metatarsus I are much shorter than in typical *robertsi*.

Family DIPLURIDAE.

MICROSTIGMA GEOPHILUM Mihi.

[Annals Transvaal Museum V, No. 3, p. 306, 1916.]

[Text fig. II, 2 and 3.]

A single male was found on January 23, 1924, under a stone in forest on the farm Coldspring, near Grahamstown.

It resembles the female in general characters rather closely, having the same minute oval stigmata with well defined chitinous border; abdomen and appendages with blunt spines and thick setae but somewhat weaker than those of the female; chelicera with single inner row of eight teeth and two minute denticles at the base of the row externally; a well defined ocular tubercle

about twice as broad as long. Carapace flattened, with lateral margins rounded more so than in the female, the anterior margin narrow, a shallow transverse fovea and three pairs of shallow radial depressions; a broad arched sternum with conspicuous third pair of sigilla; two pairs of spinners, the anterior pair minute, slightly separated at the base, posterior pair slender, the basal joint longest, two distal joints almost subequal, a whole spinner being about two-thirds of the length of the sternum. Other distinctive features of the adult male are as follows:—sternum posteriorly narrowed to a point; labium broad with three denticles; maxilla with about 30 denticles at the base: legs completely without scopulae, all the tarsi with three claws, the median one small but easily visible on all the legs under a hand lens. Each paired claw with a double row of three or four teeth on the basal half of the claw: tarsi all slender and spineless, a little shorter than the metatarsi, considerably so in IV: metatarsus I practically straight except for indication of a bend at the base in side view, with six spines ventrally, including the apical pair, all these except one short one being situated in the distal half of the segment. Metatarsus II with three pairs of spines ventrally, also one on the anterior surface about half-way along the segment: tibia I stouter than II, and much stouter than metatarsus I, but only a trifle longer than the latter: at its apex on the inner side ventrally is an elongated slender projection terminating in a straight stout spine, and from the base of this projection on its outer side there arises a more slender sigmoidly curved spine: on its under surface four pairs of stout spines, on the anterior surface three smaller spines, posterior surface spineless except one on the distal edge inferiorly: patella I with about three weaker spines on the distal edge inferiorly. Metatarsus II with three pairs of spines inferiorly, also one on the anterior surface about midway. Tibia II with three pairs of spines inferiorly, two dorsally near the base of the segment, and three on the anterior surface, one of these being on the distal edge. The segments of legs III and IV are all well spined, except the tarsi. Palps short, when stretched forwards reaching almost to the distal end of patella I: femur

with a row of several spines dorsally, tibia short, armed with stout spines and long stiff setae on the inner side arranged as a ventral row comprising five setae, and distally a long spine, above which ventral row is a row of three spines, and more dorsally, but still on the lateral surface, a single spine near the distal edge: on the outer surface there are no true spines, but numerous stiff setae and bristles occur of which the ventral ones are longest: on the dorsal surface are one or two spines distally; tarsus without tufts of hairs but armed with about six stout spines: bulb elongated and more or less pear-shaped, spine shorter than the bulb and with a decided twist. Ocular area with posterior margins of anterior row in a well recurved line: the anterior laterals are very much larger than the anterior medians which are indeed the smallest of the eyes and are about $1\frac{1}{2}$ diameters apart.

Measurements. Total length including spinners 6.5; length of fourth leg 11, of first leg 8; carapace length 2.7, width of carapace 2.3 mm.

The genus *Microstigma* is a very distinct one, differing from all South African members of the family Dipluridae in the complete absence of tarsal scopulae. In this respect, it may be merely primitive, and the comparatively short posterior spinners, not widely separated from each other, seem to point to the same conclusion.

Its affinities are however very uncertain. There is indication of relationship with the Australian and Malagasy *Brachytheleae*. Also, some of the characters recall those of the Brazilian genera for which Dr. Mello-Leitao* has recently established a special family, the *Paratropidae*. The minutely scaly integument, more or less encrusted with grains of grit, and the peculiar thick hairs seem comparable with those characters in *Paratropis*: in the latter genus, also, the anterior spinners are but slightly separated, and the apical segment of the posterior spinners is moderately long. Yet the relationship of these two genera is not so very close, the ocular tubercle being globular in *Paratropis*,

* "*Theraphosoidea do Brasil*" in *Revista do Museu Paulista*, XIII, 1923

paired tarsal claws unidentate, and the maxilla has a conspicuous process at the anterior apical angle.

According to the descriptions, the lip is immobile in Paratropidae, but free in Dipluridae. This character has been accepted as of family importance by various writers, including Dr. A. Petrunkevitch in his valuable paper on the "Families of Spiders."† But to me, the lip character seems rather indecisive for the differences are of degree only, and the male of *Microstigma* might be referred to either category.

ORDER SCORPIONES.

PSEUDOLYCHAS PEGLERI Purc.

[Ann. S. African Mus. II, p. 173, 1901.]

A single adult female example from Tsolo, C.P. (Rev. Robt. Godfrey) is noteworthy in its ill-developed crests, but the type series from Mqanduli includes specimens in which the middle lateral crest of caudal segment III is moderately well developed, and others in which it is obsolete: in the former case, the granules composing the crest are more or less separated from each other, unlike those of the other caudal crests. In caudal segment II that crest is more or less complete in females of the type series, but weak and incomplete in specimens which I take to be young males. The Tsolo specimen has the following characters.

Caudal segment II with a weak indication of the middle lateral keel in the posterior half of the segment which is quite obsolete anteriorly: III without such keel in any part of the segment, although some isolated granules occur; IV without a trace of middle lateral keel. Caudal segment V with distinct inferomedian and inferolateral crests, but the superior crest is obsolete in the hinder third of the segment. Aculeus with a fairly well developed cylindric tubercle below it, but this is not succeeded by enlarged granules, nor by median prominence: vesicle with some granules on the lateral surfaces, but no dense

†Annals of the New York Academy of Sciences, XXIX p. 145-180, 1923

granulation occurs. Tergites with weak lateral and median crests, those of the 1st and 2nd tergites especially weak.

Sternites I-IV smooth practically throughout, with the merest trace of granulation near the lateral border of IV. Hand with a few granules on the anterior surface, but only faintly granulated superiorly: seven anterior flanking granules on the movable finger. Upper surface of brachium with two weak crests.

Pectinal teeth 11, the basal one very broad and a little elongated. Surfaces generally infuscated throughout, with no conspicuous yellow markings, although the usual markings occur. Total length 27.

It is possible that the weak development of the middle lateral crest on caudal segments II and III is a character peculiar to a Tsolo race. I may add that in *ochraceus* Hirst, as known to me from Redhouse, those crests are fairly well developed.

PSEUDOLYCHAS MULTICARINATUS sp. nov. [Pl. XIII, fig. 4.]

This species is based on two specimens in the Albany Museum, a male from Mfongosi, Zululand, and a female from E. Zululand: we have also two males collected by Messrs. H. H. Curson and E. F. J. George at Ntambanana, N. Zululand.

The species is distinct from *pegleri* in that the middle lateral crest of the first three caudal segments is strong and well developed throughout, even on the third segment; also, the tubercle beneath the aculeus is subconical and strong, and is succeeded by one or more enlarged granules; and, the crests of the tergites are decidedly stronger than in *pegleri*.

Caudal segments generally with strong granular crests, the superior crest of V well developed and continuous throughout, IV with a more or less distinct trace of the middle lateral crest amongst the scattered granules that occur over the lateral surfaces of the segment. Superior crests of caudal segments I to IV with enlarged terminal teeth, especially so in the male. Vesicle with lateral surfaces densely granulated: ventrally a somewhat broken median line of larger granules extends backwards for a short distance from the subconical tubercle below the aculeus, one or two of which nearest the tubercle are raised a little

above the general surface.

Tergites with strong lateral and median crests; even on the second tergite, the median crest is long and conspicuous. Sternites I-III smooth throughout in the female except that a few granules occur immediately adjacent to the lateral margin of III; IV quite smooth over the greater portion of its area mesially, but granulated laterally and near to the posterior border mesially. In the male, the granulation is much the same except that some extremely fine granules are scattered over the middle portions of sternite IV.

Hand of female granular anteriorly towards the base of the finger and over considerable area superiorly: of male quite without granules. Seven anterior flanking granules on the movable finger. Male with strongly incrassated hands, and prominent lobe and sinus on the fingers. Two somewhat broken crests of strong granules on the upper surface of the brachium in the female. Brachium of male decidedly more slender than in female, and granules of the superior crests not so strong. Anterior prominence of brachium with a well marked denticle superiorly in the basal half of the segment.

Hands yellowish with several dark stripes above. Upper surfaces generally dark brown, abundantly variegated with yellow: on the tergites the crests are yellow, there are V-shaped lateral markings and a pair of elongated oval yellow spots anteriorly near the midline. Outer surfaces of femora dark with several yellow spots and dorsally a yellow stripe: of patellae dark with one long stripe down the middle, above it several yellow spots and below it a short oblique stripe.

Pectinal teeth, 12-13, in both sexes, the basal tooth of the female much enlarged in breadth and slightly also in length. A male from Ntambanana has 14 pectinal teeth. Total length, 27.5.

This species would seem to be distinct from the Mashonaland form *P. nigrimanus* Krpln., described as a variety of *pegleri*, and characterised by the possession of six flanking granules on the movable finger; apparently the median lateral keel of the fourth caudal segment is stronger in that species.

However, the only example I have actually seen from the Zambesi region has seven flanking granules on the movable finger, the middle lateral crest is very weak on caudal segments II, obsolete on III and IV, crests of tergites decidedly stronger than in *pegleri*, 10-12 pectinal teeth, tail and hands yellow without infuscation: the specimen is a young female from Amatongas Forest, P.E.A. (Dr. G. Arnold). I hesitate to refer this to any species yet described.

HADOGENES TRICHIURUS PARVUS subsp. nov. [Pl. XIII, fig. 1.]

This sub-species is based on a series of male and female specimens found under stones on the farm Resolution, Fort Brown: they were presented to the Albany Museum by Miss A. Walton along with many other Arachnid rarities. It is of interest as the most primitive of all known forms in the shape of the hand, that is to say, it agrees better than any other with the genus *Opisthacanthus* from which *Hadogenes* is presumed to have arisen: it is also one of the smallest forms, but simplicity and smallness are not necessarily associated, for a very small form of *trichiurus* found at Ludlow has typically elongated hands.

Its nearest ally is *whitei* Purcell, described from Brak Kloof, near Grahamstown, from which it is chiefly distinguished in the form of the hand—which is short and broad—in the somewhat coarser sculpturing of the hand, and in the form of the first caudal segment of the female.

Male. The carapace has well marked frontal lobes and is rather more coarsely granulated than in *whitei*, the granules being larger and not so closely aggregated as in the latter form, where in the hinder portion the granules tend to fuse into a fine shagreen. Supero-median groove of first caudal segment continued to the end, not abruptly terminated by a posterior swelling of the dorsal surface as in *whitei*.

Second caudal segment with spiniform but not recurved terminal teeth on the superior crests, III with a subspiniform tooth, IV slightly enlarged terminal tooth. Vesicle smooth. Humerus short, the anterior and posterior margin of the upper

surface not sub-parallel, the latter, or both, being lightly curved as in females of the genus.

Hand comparatively stout, the upper surface lightly convex towards the inner (anterior) edge, which is well defined by a row of enlarged granules: the infero-anterior crest is still stronger, extending as an unbroken crest of large granules almost to the base. (In *whitei*, the crests are not so strong, and thus to the naked eye the upper and anterior surfaces are not sharply separated in that form.) Upper surface of hand more or less sculptured throughout. The width of the upper surface of the hand is subequal to the distance between the tip of the movable finger and the apex of the lobe (in *whitei* the latter distance is greater).

The colour is dark olive with pale legs and hands.

Female. First caudal segment short, but not markedly swollen, being decidedly higher than broad behind. Hand relatively broad, short, and stout, with curved upper surface. Inner margin of upper surface fairly well defined by a crest of isolated large granules: this inner margin distinctly curved throughout its length, being over no portion of its length parallel to the posterior crest. Upper surface without smooth areas except along narrow lines. Brachium not so flattened as is normally the case in this genus and thus the position of the crest corresponding to the postero-dorsal crest of *Opisthacanthus* is well indicated. Caudal segment II with terminal enlarged tooth on the superior crest, III with a less enlarged tooth, and there may be a small tooth on I.

Measurements. Length of carapace M. 10.6, F. 11.6; breadth of carapace M. 10.6, F. 11.6; posterior height of first caudal segment M. 3, breadth of same 2.6; length of caudal segment I, M. 8.8, F. 5.3; of II, M. 11.5, F. 7; of III, M. 12, F. 7.6; IV, M. 13.1, F. 8.8; of V, M. 12.9, F. 8.8; of vesicle M. 6.7, F. 6.75. Breadth of upper surface of hand M. 6.8, F. 7.7; length of hand M. 19.6, F. 21.

Number of pectinal teeth M. 17-18, F. 12-15.

In assigning merely a subspecific position to *parvus*, it is

suspected that in intervening localities more or less intermediate forms between this and other varieties of *trichiurus* may occur. Actually, in this genus no instances are known where the same form is quite stable over wide areas. The grouping of the numerous local forms into species is also somewhat arbitrary: in short, the conventional system of species and subspecies does not lend itself well to the classification of this protean genus.

Other kinds of *Hadogenes* occur in the neighbourhood of Grahamstown, but as they do not differ greatly from one or other of the two here recognised, I refrain from naming them. Specimens somewhat similar to *parvus* have been taken under stones on the crest of the hill above the railway at Blaauwkrantz (R. Essex) and at Manley Flats (J. Hewitt), along with *Uroplectes triangulifer*, *Parabuthus planicauda*, and *Opisthophthalmus latimanus*: yet these specimens have longer tails than the Resolution series, the male carapace is more finely granular, but all, like *parvus*, have pale legs. Another large variety with pale legs is known from a female specimen taken on farm Kilbrick near the lower portion of the Fish River (R. McKillen).

In the shape of the hand, its comparative smoothness, and the weakness of the supero-anterior crest, *whitei* approaches the Karroo form *graciloides*, the type of which came from Cradock. These two forms are easily distinguished on the characters of the first caudal segment of the female: yet this seems of no great systematic importance, and the two may be regarded as slender and stout forms of the same thing. *Whitei* is a darkly pigmented variety, the legs and hands being reddish brown. Immature specimens referred thereto are known to me from Fish River Rand, and we have very dark juvenile examples from Hounslow. An adult male example from Queen's Road, about midway between Grahamstown and Fort Brown, has various characters of *whitei* but the hands incline towards *parvus*.

The measurements of the hand in the type male of *whitei* Purcell from Brakkloof [Pl. XIII, fig. 2] are: width of upper surface 6.7, total length 22. There is no female from the type locality in our collection, but one probably referable to *whitei*

taken near Alicedale (W. W. Austin) has the following hand measurements: breadth of upper surface 8.1, total length 24.2.

OPISTHACANTHUS BROWN¹ sp. nov. [Pl. XIII, fig. 3.]

Types: a series of male and female specimens collected at Assegai Bosch, Humansdorp district, C.P., by Dr. H. Maughan Brown, during November, 1924. These and scorpions from many other localities were presented to the Museum by Dr. Brown.

Tarsi III and IV with 5.4 spines on the inferior margins, including those at the angles: a median row of spicules generally present, but sometimes almost obsolete, on the lower surface of each tarsus between the spinous rows. Inferior surface of vesicle and sides of fifth caudal segment without granules, or with some very fine granulation. External surface of hind patella almost without granules in female, with some very fine granulation especially over the lower half in adult male. The smooth areas on the anterior portion of the carapace are quite devoid of granules, or sparsely and finely granulated. Hand with upper and hind surfaces obtusely inclined—very obtusely in females—and separated by a prominent ridge which extends as such over the whole length of the hand almost connecting up with the ridge which runs along the middle of the immovable finger: the hand-ridge though well raised throughout may be considerably broken up in females, but almost continuous in males. Upper surface of hand somewhat rounded, coarsely sculptured on the inner or anterior side, almost smooth over a considerable area towards the ridge. Fingers relatively broad and short, especially the immovable one: a well marked lobe on the movable finger and rather deep sinus on the immovable one. Vesicle relatively large, decidedly larger than in *asiaticus*. Pectinal teeth, male 6-7, female 5-7.

Colour: blackish throughout, except vesicle which is yellow and tarsi of legs which are pale brown.

Measurements: total length, female 71 mm., male 59. Breadth of hand, female 7.4, male 6.75; length of handback, female 8.1, male 7.1; length of movable finger, female 9.6, male 8.2.

The spinulation of the tarsi is very constant. Adults have invariably a spine at the angle in tarsi III and IV, but in juveniles it may be setiform. In a series of 39 specimens, the only variations found are:—Two specimens adult females, have 4.4 spines on the third leg of one side only. Another, an adult male, has 6.4 on the fourth leg of one side, and a young female is similar except that the sixth spine is a very weak one. A juvenile male has 4.4 spines on both third legs, the missing spine in each case being represented by a spiniform seta: another juvenile has the fifth spine setiform on the third leg of one side only.

This species is related to *asiaticus* Keys., which occurs in the neighbouring district of Uitenhage, but differs therefrom in the complete absence of granular rows under the vesicle, and in the hand characters. It is well distinct from *equispinus* Kraepelin, the types of which came from Zwartberg Pass, but which is known to me only from Mossel Bay. The more extensive smoothness of the hand in that species, and the absence of a prominent ridge separating its upper and hind surfaces will at once distinguish the two; moreover, the tarsal spinulation is different. The vesicle characters, however, are the same in specimens from Mossel Bay and Assegai Bosch: in this respect, Mossel Bay specimens seem to differ from the type of *equispinus* as described by Kraepelin, and perhaps the Mossel Bay form is one of the connecting links between typical *equispinus* and *browni*. Another probable link is known to me from Humansdorp, for specimens of which I am also indebted to Dr. H. M. Brown. In this form, the third and fourth tarsi have 5.5 spines as in *equispinus*, but the hand resembles that of *browni* in shape, yet differing therefrom in that the upper surface is more sculptured, and smooth areas practically obsolete.

O. browni therefore is to be regarded as one of the extreme forms amongst the simpler members of a distinctively Cape group. The geographical data with regard to that group are as follows:—*asiaticus* is known from Alicedale, Redhouse, Van Staadens, Kamaehs near Uitenhage, and Dunbrody on the Sundays River: its very close ally *capensis* is known from Knysna and

Barrington: *browni* is known from Assegai Bosch, Karreedouws, and Kromme River: *equispinus* occurs at Zwartberg Pass, and has a distinct variety at Mossel Bay diverging in the direction of *browni*: the Humansdorp form can for the present be considered as belonging to either *equispinus* or to *browni*, according to the relative importance attached to the characters of the tarsal spines or of the hand, but is in either case a peculiar variety.

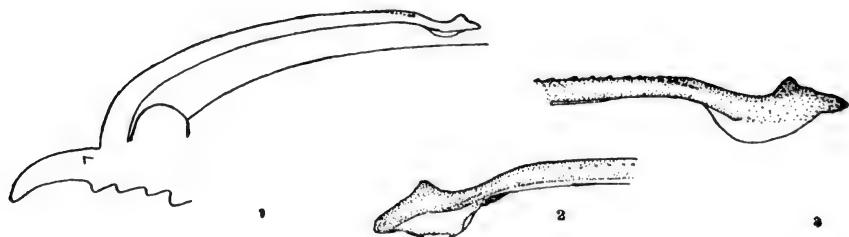
SOLPUGA LOVERIDGEI sp. nov. [Text fig.]

Description of male:

Dentition. Distal series of teeth in upper jaw with a single intermediate tooth which is decidedly smaller than the two preceding teeth, or than the one succeeding: it is nearer to the latter than to the former, so that there is an interval between the first pair and the second pair. A small dorsal tooth on the inner side of the upper jaw, immediately in front of the anterior bend of the flagellum. Terminal fang fairly strong and well curved.

Upper surfaces of chelicera with strong subspiniform setae. Lower jaw only with a few feather bristles on the mesial surface, though simple bristles are numerous: feather bristles are not very strongly developed on the upper jaw.

Flagellum. Basal enlargement of flagellum small, the upper edge rounded and more or less compressed into a keel. Procurrent portion very short, considerably flattened antero-posteriorly immediately at the base. Shaft tapering gradually therefrom, and reaching backwards beyond the middle of the mandible, but not so far as the headplate: over the greater portion of its length it is very lightly curved or almost straight, but near the apex it becomes twisted and dorsally a small sinus appears. Dorsally, over a distance equal to about half the total length, there is a weakly denticulate crest, which distally twists inwards and terminates at the commencement of the sinus. At the distal end, just beyond the sinus, the upper edge is roughened and the apex is blunt: a delicate translucent membrane arising from the mesial side of the shaft, and folding inwards and a little up-



Text figure III. *Solpuga loveridgei* sp. nov.

1. Terminal portion of right upper jaw with flagellum of adult male, seen from inner side
2. Distal end of flagellum more enlarged
3. Same, from outer side

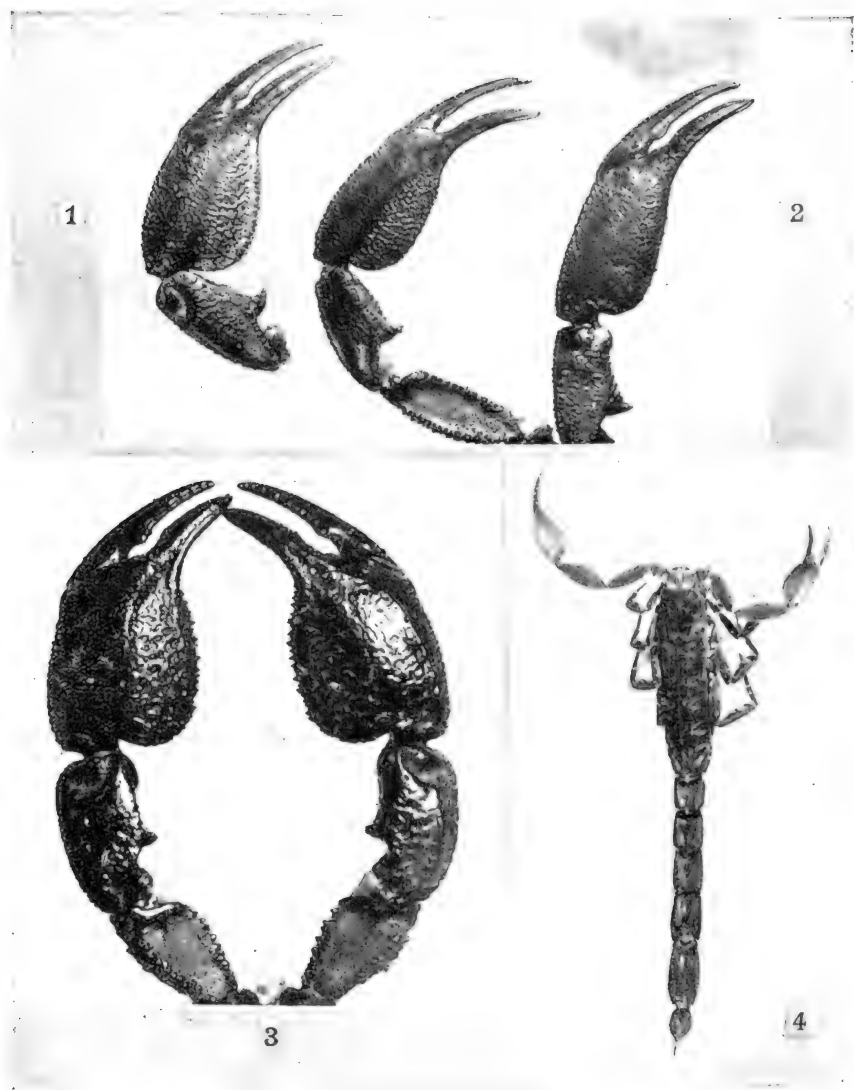
wards, forms a miniature pouch-like outgrowth near the end of the shaft. Anterior bend of flagellum immediately over the hind end of the first tooth.

Colour. Head-plate, chelicerae, and legs above dark brown: tergites blackened, sides of abdomen with pale yellowish hairs.

Measurements: Length of flagellum 5, of tarsus and tibia of palp 10, of patella of palp 10, of patella IV 9, of tibia IV 8.8

Type. A single adult male in the Albany Museum from Kisumu, Kenia Colony, collected by Mr. Arthur Loveridge, 19.11.22.

This species is closely related to *S. nasuta* Karsch, and more remotely to *S. capitulata* Karsch and *S. fordi* Hirst, differing therefrom in the character of the apical portion of the flagellum. The complete absence of a well-marked denticle or spine on the upper side of the flagellum immediately anterior to the distal sinus, distinguishes it from *nasuta* and from the doubtfully distinct variety of that species which on female characters was separated as *semifusca* by Mr. Pocock. The British Museum has male specimens referred to *semifusca* from Kitui (S. L. Hinde) and from Takaunju (B. Percival).



1. *Hadogenes trichiurus parvus* subsp. nov.
3. *Opisthacanthus browni* sp. nov.

2. *H. t. whitei* Purc.
4. *Pseudolychas multicarinatus* sp. nov.



EXPLANATION OF PLATE XIII.

1. *Hadogenes trichiurus parvus* sub-sp. nov., dorsal view of palp of female (left), and of male (right) enlarged.
2. *Hadogenes trichiurus whitei* Purcell, dorsal view of palp of type male, enlarged.
3. *Opisthacanthus browni* sp. nov., dorsal view of palps of male, enlarged.
4. *Pseudolychas multicarinatus* sp. nov., dorsal view of male, enlarged.

**On the South African Triassic Rhynchocephaloid Reptile,
"Eosuchus" Colletti, Watson.**

By R. BROOM, D.Sc., F.R.S., C.M.Z.S.

[With Plate XIV.]

In 1912, Prof. D. M. S. Watson while in Grahamstown examined the very fine specimen of the Rhynchocephaloid reptile which the Museum had obtained some years previously from near Cradock, and considering that it ought to be described named it *Eosuchus Colletti* (see Rec. Alb. Mus., Vol II, p. 298-9). A few years before Watson's visit, I had made a careful study of the specimen, but thought it better to delay publication of the description as the specimen lacks the head and anterior third of the body. It is highly probable that the missing parts are still lying near the spot where the specimen was picked up, as the fracture across the front of the specimen is a moderately fresh one. Unfortunately, I have never had an opportunity of examining the locality, and in the meantime as the specimen has been named it seems advisable that a fuller description should be published.

The specimen is from the Cradock district, and though so far as I am aware no geologist has critically examined the locality, we may with much probability regard it as being in the *Lystrosaurus* zone, and thus refer the fossil to the Lower Triassic age. As the generic name *Eosuchus* is preoccupied, I beg to suggest the name *Noteosuchus*, for the genus which is manifestly new.

The specimen consists of a series of 11 dorsal vertebrae, two sacrals, and a few caudals of which the first four are well preserved; the ribs and abdominal ribs of the posterior half of the body; the left manus and forearm, and part of the right forearm; and the whole of the pelvic region and hind limbs. Round the outside of the nodule are a series of 17 distal caudal vertebrae. It would seem natural to assume, as Watson did, that this is the tail of the animal whose skeleton forms the centre



Notosuchus celletti Watson

of the nodule, but if this be the case, the tail must have been detached and fossilised in the reversed position, with the proximal vertebrae lying near the right forearm and the distal near the right foot. Not improbably, this is the tail of a second specimen of probably the same species. A much more interesting occurrence is the presence of the remains of a small animal lying between the left foot and the tail, which cannot be clearly seen in the photograph, but of which I give a figure. Opinions will differ as to the nature of this small animal. Unfortunately, it is badly preserved and one hesitates to give a very decided opinion. Watson saw the little animal, but says nothing about it in his paper. The view which I took when I first saw the specimen I still hold, namely, that the little animal is a newly-born young one to which the mother gave birth when dying.

The photograph given of the principal skeleton represents the dorsal aspect of the bones. The centre of most of the dorsal vertebrae have been split through, while the last three dorsals are entirely in the counterslab.

The vertebrae are well ossified and well preserved. The dorsals have large spines, not very high but greatly expanded anteroposteriorly. The zygapophyses are moderately close together. From the lower and anterior side of each arch, there springs a fairly large transverse process which gives a broad articulation to the single-headed rib. The centrum is moderately long, much constricted in the middle, and biconcave, but not deeply so. Between each pair of centra, there is inferiorly a small, thin intercentrum. As will be seen from the figure I give, the dorsal vertebrae are essentially Rhynchocephalian in structure. In general appearance, the vertebrae are not unlike those of *Protorosaurus spenceri*.

The sacrum is composed of two vertebrae, each of which has a large sacral rib which supports the ilium. The two vertebrae are not ankylosed, and some slight movement was possible between them. The sacral ribs are not well preserved, but, so far as can be seen, are not unlike in general form and proportions those of the lizard *Varanus*. The first is however distinctly



Notosuchus Colletti (Watson)

- A Restoration of skull of small skeleton referred to this species
 B Slightly restored side view of dorsal vertebrae (7th in front of the sacrum) of type
 C Pelvic bones of type, slightly restored and arranged in one plane
 On the left is a drawing of the small skeleton, very slightly enlarged

longer than the second. The tip of the transverse process or rib of the first caudal practically touches the ilium, but apparently does not give it any support.

The first four caudals are fairly well preserved. They have each long, straight, transverse processes or ribs. These processes are completely ankylosed to the arches, but doubtless have had autogenous centres of ossification.

Of the fore limb, the only long bones at all well preserved are the right radius and the left ulna, and though these are not quite perfect, they show conclusively that the fore limb was well developed, and that the animal must have walked and run like lizards and *Sphenodon* on all fours.

The carpus and manus are fairly well preserved, but the elements are considerably displaced. The manus probably agrees closely in structure with that of *Sphenodon* but the phalanges are relatively more slender.

The pelvis is fairly well preserved and it is possible to make an almost perfect restoration of it. It is of the old-fashioned type found in most primitive Diaptosaurians—an ilium expounded antero-posteriorly and platelike pubis and ischium. The ilium is very similar to that of *Howesia Browni*. The acetabular portion is large, and the posterior and upper part has a small superior bounding edge of bone, but the other parts are directly continuous with the upper surface of the ilium. The pubis is large and flatter than in either *Howesia* or *Erythrosuchus*. The anterior and outer border is rounded and thick, and agrees with that in *Erythrosuchus* but differs from that of *Howesia* in having no pectineal process or tubercle. The ischium is large and moderately flat, fairly like that of *Howesia*, and less like that of *Erythrosuchus*.

The hind limb is well developed, and the tibia and fibula are nearly equal in length to the femur. The femur has the slight double curve seen in so many reptiles. Each end of the femur and of the other long bones has been largely cartilaginous. The tibia is slightly curved and the fibula moderately straight. So far as can be seen, none of the long bones of the hind limb presents any exceptional features. They are all a little longer and more slender than in *Howesia*.

Both tarsi are preserved, but both are broken across and neither is quite fully displayed. There is certainly a large fibulare with a well developed heel process, and a large intermedium. Whether there is also, as is probable, a tibiale, could only be made out by injuring the specimen. There is a large 4th tarsal, and the 1st, 2nd and 3rd tarsalia are relatively small. The 1st metatarsal is small. The 2nd metatarsal is about twice as long as the 1st. The 3rd is a little longer and stronger than the 2nd; and the 4th a little longer than the 3rd, and much stronger. The 5th metatarsal is short and very stout, and is typically hooked as in *Sphenodon* and all its allies. The phalanges of the first four digits are normal in structure, and apparently in number, but in the 5th digit there are probably only three relatively short phalanges.

The whole abdominal region is protected by a plastron of

numerous feeble abdominal riblets. These abdominal ribs are arranged in successive series of bony splints. Each has a median curved piece and two very slender splints. There are three series to the length of each vertebra. All the bony splints are very slender.

Though the head and shoulder girdles are lost, we can determine the systematic position of *Noteosuchus* with some probability. Watson in his note calls attention to the resemblance of the ilium to that of *Erythrosuchus*, and further suggests an affinity with *Mesosuchus*. Unfortunately, all the skeletal remains which Watson considered to be those of *Mesosuchus*, are really those of *Euparkeria capensis* and *Browniella africana*, which are typical Pseudosuchians. No doubt there is some resemblance between *Noteosuchus* and the early Pseudosuchians such as *Euparkeria*, as there is some resemblance between it and any of the Triassic Rhynchocephaloids; but *Noteosuchus* cannot be a Pseudosuchian such as *Euparkeria*. The pelvis and pes differ very markedly from those of the typical Pseudosuchians. On the other hand, the agreement with the Rhynchocephaloid or Gnathodont *Howesia* is considerable, and the resemblance of the ilium to that of *Erythrosuchus* pretty certainly indicates some affinity. We know that *Erythrosuchus* is an ancestral Phytosaur, not yet specialised as are the Phytosaurians. We know further that the Phytosaurs are really not very far removed from the *Sphenodon* ancestor. We are thus led to the conclusion, even in the absence of the skull, that *Noteosuchus* is a representative of the ancestral group from which branched off in different lines the Gnathodonts, Rhynchocephalians and the Pelycosimians and Phytosaurs. In the absence of the skull, one hesitates to place it in any of the known orders, but for convenience we may place it in the family Noteosuchidae, and provisionally in the Rhynchocephalia.

If the little animal shown on the same slab be a newly born *Noteosuchus*, as I believe, it gives us some idea of the skull.

Unfortunately the skull is very immature, and is crushed nearly flat, so that it is impossible to clearly make out the structure. A few points are fortunately quite manifest. The

frontal bones are well preserved in undisturbed position so that we can determine the orbit with certainty. One parietal is also fairly well preserved in position. Further, we have the greater part of one maxilla. We can thus determine that the animal was a broad-headed, short-snouted form. The restoration I give shows that there is considerable resemblance to the skull of the embryonic *Sphenodon*, as figured by Howes and Swinnerton. There is also a suggestive resemblance to the skull of *Sauranodon*.

Sufficient of the skull is preserved to show, I think with little doubt, that the small skeleton is a very immature Rhynchocephaloid reptile; and as it is found near the pelvic region of a large mature Rhynchocephaloid reptile and is of just the size that one would expect the young to be on emerging from the egg, I think we may conclude that we have in the small skeleton the remains of a newly born *Noteosuchus*. Extremely little is known of the reproduction of extinct reptiles. The large majority were doubtless oviparous, but *Ichthyosaurus* gave birth to well developed young. *Sphenodon* itself is oviparous, but lizards and snakes vary greatly in their modes of reproduction even in closely allied genera. Thus the typical *Chamaeleon* like *C. quilensis* is oviparous, but the small Chamaeleons like *C. pumilus* are viviparous, giving birth to a large number of fully formed, active little young. Personally, I hold with Methuen and Hewitt (see Trans. Roy. Soc. S. Af. IV, p. 89-104, 1914) that the Chamaeleons of the *C. pumilus* group ought to be placed in a distinct genus *Lophosaura*, but the remarkable fact remains that species which Boulenger places in one genus are in part oviparous and in part viviparous. Possibly, the habits of a reptile determine whether the egg is laid soon after fertilisation or is retained in the oviduct till the embryo is fully formed.

ADDENDUM.

During Baron von Huene's visit to South Africa, he examined this interesting fossil in Grahamstown, and will doubtless be publishing some notes on it. I do not know what his opinions on the larger animal may be, but he has come to certain conclusions with regard to the smaller one that differ so greatly from mine that I think they ought to be stated in this paper, and I have his permission to do so. The mere fact that von Huene and I have come to different conclusions with regard to the affinities of the little skeleton, and that Watson in 1911 came to quite a different conclusion from either of us, will show that the condition of the skeleton is far from satisfactory and that any conclusion must be accepted with caution. Knowing both Watson's opinion and von Huene's, I am still quite definitely of opinion that the small skeleton is that of a young *Noteosuchus*.

Von Huene considers that the skeleton is that of a *Cistecephalus*. Against this it may be mentioned:—(1), that while the skull is bad, one frontal bone is well preserved, and is quite unlike the frontal of *Cistecephalus*; (2), a maxilla is fairly well preserved, and is quite unlike the maxilla of *Cistecephalus*; (3), a humerus is preserved, and while we do not know the humerus of *Cistecephalus* we can be quite certain that the little humerus in this skeleton is not an Anomodont humerus; and (4), the specimen is almost certainly from the *Lystrosaurus* zone where *Cistecephalus* does not occur.

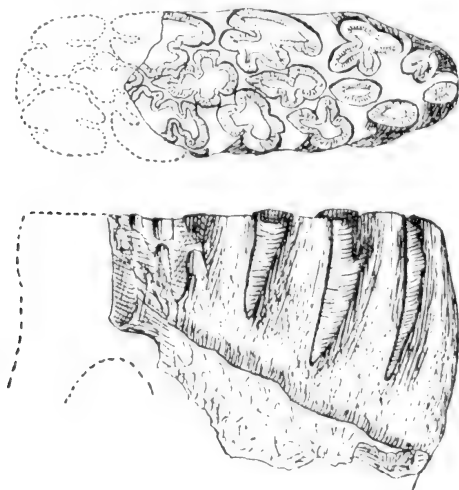
Watson was of opinion that the little animal is a *Branchiosaurus*. It must be admitted that there is considerable superficial resemblance, but against this conclusion the following may be urged:—(1), The skull is manifestly longer than broad; (2), the frontal bone is quite unlike the frontal in *Branchiosaurus*, but is typically Rhynchocephalian; (3), there are in the little skeleton slender curved ribs quite unlike those of *Branchiosaurus*; (4), there are elongated tibia and fibula quite unlike those of *Branchiosaurus*; (5), there are elongated lizard-like metatarsals; and (6), while *Branchiosaurus* is a Permian type, this little skeleton is pretty certainly a Triassic form.

**On evidence of a Giant Pig from the late Tertiaries of
South Africa.**

By R. BROOM, D.Sc., F.R.S.

On a recent visit to Port Elizabeth I was shown by Mr. Fitzsimons, Director of the local Museum, a most interesting fossil tooth which had been presented to the Museum by Mr. L. Hiltzeroth. The tooth had been found in the diamondiferous gravels near Longlands in the Vaal River Valley. It is manifestly the third lower molar, probably of the left side, of a gigantic extinct pig of a new type.

The tooth is remarkable not only for its great size, but also for the great height and multiplicity of the cusps. A considerable part of the anterior end of the tooth is lost, but from the condition of the root we may be moderately certain that the missing part included the whole of the anterior pair of lateral cusps,



Lower third molar of *Notochoerus capensis*
Br., about $\frac{2}{3}$ nat. size

the anterior median cusp and most of the second median cusp. In the drawings given, I have restored the tooth to what I believe was the original condition.

The tooth bears a little resemblance to the molars of some of the extinct pigs of the Siwalik of India, especially *Sus falconeri* Lydekker, and suggests also some affinity with the Wart-Hog, *Phacochoerus*. There are five pairs of lateral cusps and six median cusps, and the median cusps are so large that they completely separate the lateral cusps from each other as they also do in *Phacochoerus*. The anterior cusps are much infolded as in *Sus*, but the posterior are simple rounded pillars as in *Phacochoerus*.

The following are some of the measurements of the tooth:—Greatest length as preserved, 64 mm.; greatest length when perfect, probably, 79 mm.; greatest width between the second pair of cusps, 30 mm.; height of posterior cusp, 45 mm.

The differences from *Sus* are I think sufficiently great to warrant the placing of this South African pig in a new genus, and I propose the name *Notochoerus capensis* gen. et sp. nov.

It is extremely difficult to give the geological age of the deposit in which the tooth was found, and even if one could, there would remain the further question whether the tooth had not been washed into the deposit from an earlier bed. I think the evidence is in favour of the tooth being contemporaneous with the diamond gravel, but this must be very ancient—probably pleistocene—possibly pliocene.

On some Carnivorous Therapsids

By R. BROOM, D.Sc., F.R.S.

LYCAENOGNATHUS PLATYCEPS (Seeley) gen. nov.

The genus *Cynognathus* was founded by Seeley in 1894 for the reception of one or two large Cynodont reptiles found by him in South Africa. The most important species is *Cynognathus crateronotus* represented by the beautiful classical skeleton now in the British Museum, and this is the type species. Other species described by Seeley were *C. Berryi*, *C. Platyceps*, and *C. leptorhinus*. In 1904, I pointed out that *C. leptorhinus* is really a synonym of *C. platyceps*, being founded on a crushed snout. But no one has hitherto so far as I am aware expressed any doubt of the correctness of placing *C. platyceps* in the same genus as *C. crateronotus*, and yet I think there is good reason for placing it in a distinct genus.

Even allowing for crushing, *C. crateronotus* has a skull very differently proportioned from that of *C. platyceps*. In the former, the nose is much wider and the muzzle more massively built; the teeth are more powerful, and there are many differences in the base of the skull and palate. But these would alone not be very convincing reasons for placing the two species in different genera. The structure of the teeth however is sufficient to warrant the establishment of a new genus for *C. platyceps*.

In *C. crateronotus* there are nine teeth behind the canine. The first is a simple tooth without lateral cusps. The second is also simple with the merest rudiment of a posterior cusp. The third, fourth and fifth teeth have each in addition to the main powerful cusp, a well marked posterior cusp with two rudimentary others—one in front, and the other behind. The sixth, seventh and eighth teeth are much more powerful and are similar in structure. A small cusp in front is followed by the large main cusp and this by a small third and still smaller fourth cusp. The ninth tooth has the crown badly preserved.

In *C. Berryi* the molar structure is very similar to that in *C. crateronotus*.

In *C. platyceps* the first three of the post-canine teeth are evidently simple: the next three have in addition to the main cusp a fairly well developed anterior and posterior cusp. But the last three molars are entirely unlike those of *C. crateronotus*, in that in front of the main cusp there are two well developed cusps and other two behind the main cusp. The back molars of *C. crateronotus* are thus seen to have four cusps: those of *C. platyceps* to have five cusps. This difference in the molar structure seems to justify the placing of *C. platyceps* in a new genus which I propose to call *Lycaenognathus*.

BAURIODES WATSONI gen. et. sp. nov.

During Watson's visit to South Africa in 1911, he discovered at Essex near Burghersdorp a small skull which he identified as belonging to a form I had previously described as *Bauria cynops*. The specimen consists of a fairly good, but much weathered skull and some other bones, the most important of which is the shoulder girdle. Watson described the skull (P.Z.S. 1914, p. 1,021), and gave a figure of a restoration of the palate.

The upper surface of the skull is hopelessly weathered and much crushed so that no characters of importance can be made out, and the occiput is completely gone. Fortunately, most of the teeth are well preserved, and much of the structure of the palate can be made out. All the teeth—incisors, canines and molars—are much worn, and though the jaws are much fractured, showing many sections of the tooth-bearing regions, there is no evidence anywhere of a dental succession. We are therefore justified in concluding that the skull is that of a fully mature and even aged animal.

The dental formula is i. 4/4, c. 1/1, m. 12/12.

The four upper incisors occupy a space of 12.5 mm., and between the fourth and the canine is a diastema of 5 mm. The canine measures 3.5 mm., and is closely followed by the first molar, there being a diastema of only 1 mm. The 12 molars measure 28 mm. In the lower jaw the incisors are slender, the four together measuring only 7.5 mm. and the 12 molars measure 31 mm.

In *Bauria cynops* the upper incisors measure 15 mm. and 10 upper molars measure 31 mm. When *Bauria* was first described, it was believed to have but 10 molars. Further development shows there are 11, but there cannot be 12. Watson's specimen must thus be placed in a new genus. Even supposing the type of *Bauria cynops* had lost a tooth, which is hardly likely, and to be thus referable to the same genus as Watson's specimen, the two unquestionably are specifically distinct. In *Bauria cynops* 11 molars in the lower jaw measure 34.5 mm. In Watson's specimen 12 molars in the lower jaw measure only 31 mm.

THE GORGONOPSIA.

The most important paper on the morphology of the Carnivorous Therapsids that has appeared for some years is one recently published by Watson, "The Bases of Classification of the Theriodontia" (P.Z.S. 1921, p. 35). He gives a detailed description of the British Museum types originally described by Owen, *Gorgonops torvus*, *Lycosaurus pardalis*, and *Arctognathus curvimola*. Further, he gives a very full account of the skull of *Scymnognathus whaitsi* founded on three imperfect specimens in the British Museum, and of a skull of a new type of Gorgonopsian which he names *Leptotrachelus eupachygnathus*. From these specimens, he is enabled to give the fullest account that has yet appeared of the Gorgonopsian skull, and he discusses at considerable length the relationships to other forms and the evolutionary trends.

In this short note, I do not wish to enter into any detailed criticism of Watson's paper, as I hope shortly elsewhere to give a full account of the structure of the group, but it might be well here to point out certain characters of the palate which we have both hitherto misunderstood.

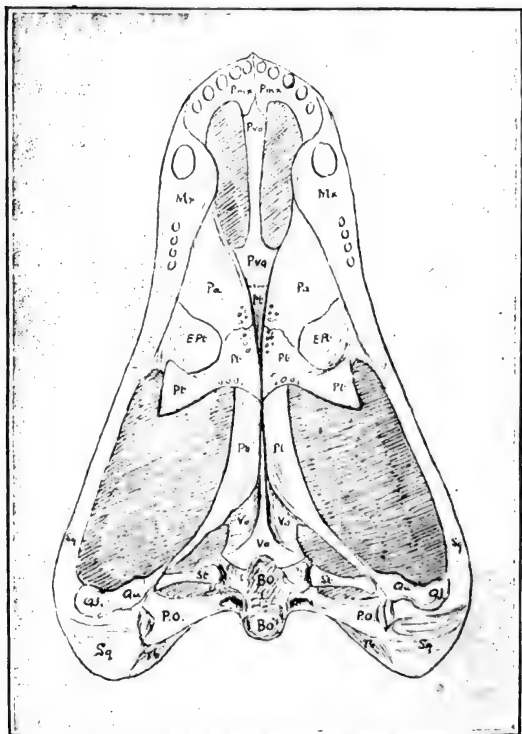
This year (1924) there has just appeared an important paper by Houghton, "On some Gorgonopsian skulls in the collection of the South African Museum" (Ann. S.A. Mus., Vol. XII, pt. 12, p. 499-518). Besides giving many details of the structure of the specimens already known, he describes two new species

and one new genus founded on beautiful skulls. He discusses Watson's paper and conclusions, and calls attention to the discovery which I had made and communicated to him that the median bone behind the pterygoids is the true vomer.

In 1913, I figured and briefly described the palate of *Scyliacops capensis*. The whole skull is beautifully preserved, but as the lower jaw is in position it was impossible to make out the structure of the anterior part, and the back part was in one important point misinterpreted. With the new facts which I now have it is possible to correct my 1913 account, and Watson's much later work.

Between the internal nares is a median bone which in many forms has a broad palatal base and from this there rises a thin median sheet. In those skulls which are uncrushed, like *Aelurognathus tigriceps* and another skull I have, this upper median plate is an entire uninterrupted sheet of bone. The restoration which Watson gives (fig. 13) of this internasal bone is quite unlike what I find in the uncrushed specimens. This bone I believed in 1913 to be the true vomer, but was later forced to give up this idea. It is now known without doubt to be the fused prevomers, as I had held previous to 1913.

Towards the back of the internal nares we meet the palatines. Each forms a large support to the maxilla. The front part of the palatine is accurately shown in Watson's figure of *Scymnogathus Whaitsi* (fig. 11), and the back part probably correctly in the palate of *Arctognathus curvimola*. The palate in the type skull of *Gorgonops torvus* is very unsatisfactorily preserved. Much of the palatal surface of the prevomer is missing, and probably some of the anterior parts of the pterygoids. The small median bony element regarded as vomer by Watson will probably prove to be a portion of the ethmoid which in Gorgonopsians is of very large size. In skulls where the palatines are perfectly preserved, they are seen to pass inwards and backwards to meet the pterygoids and ectopterygoids. In some forms, the anterior portions of the pterygoids are slender, and in these the palatines approach each other, but the pterygoids probably always come between them. The back parts of the posterior nares are formed



Palate of *Scylacops capensis* Br. restored in front from
that of *Scylacognathus parvus* Br., and the vomer
from other Gorgonopsians

by the prevomers as in Therocephalians, and the pterygoids meet the prevomers in much the same way as in these other Therapsids. The ectopterygoids are as they have been figured by Watson and myself. The pterygoids are practically as I figured them in 1913, except that there is an anterior process between the palatines. Watson has only been able to figure the pterygoid in *Arcto-*

gnathus. His figure is fairly satisfactory, but I doubt the correctness of the determination of the part marked "Vo"—vomer. It will probably be found to be part of the pterygoid.

No one has ever suspected that the median ridge between the pterygoids, and which passes backwards towards the basioccipital, was anything but the basisphenoid, or basisphenoid behind and pterygoid in front. I have recently discovered that it is the true vomer or parasphenoid. Part of this structure passes forwards between the pterygoids and completely divides the posterior parts of these bones. Slender continuations of the pterygoids extend to the quadrates. A very long-based epipterygoid is firmly fixed into the upper side of the posterior process of the pterygoid.

This discovery of the true mammalian vomer necessitates a slight alteration in our views of the mammalian origin. Watson years ago suggested deriving the mammal from a Therocephalian rather than from a Cynodont. In my Croonian Lecture (1914), though inclining to a primitive Cynodont as the ancestor, I admitted the possibility of the correctness of Watson's suggestion. The identification of the true vomer makes it almost certain that the mammalian ancestor was either a primitive Gorgonopsian or a Therocephalian, as the bone which supports the secondary palate in the Cynodonts is the prevomer, the true vomer being kept behind by the meeting of the huge pterygoids.

Watson has called attention to the fact that a number of the species that have been referred to the genus *Scymnognathus* cannot belong to this genus. With this I quite agree. One hesitates to make new genera unless one can point out the generic distinctions, and when dealing only with snouts this is practically impossible. Still something can be done to meet Watson's suggestion.

Scymnognathus angusticeps is from a horizon high up in the Cistecephalus zone, and is certainly worthy of generic rank. One striking feature is that the preparietal is quite rudimentary though still present. For this species the genus *Lycanoides* may be proposed.

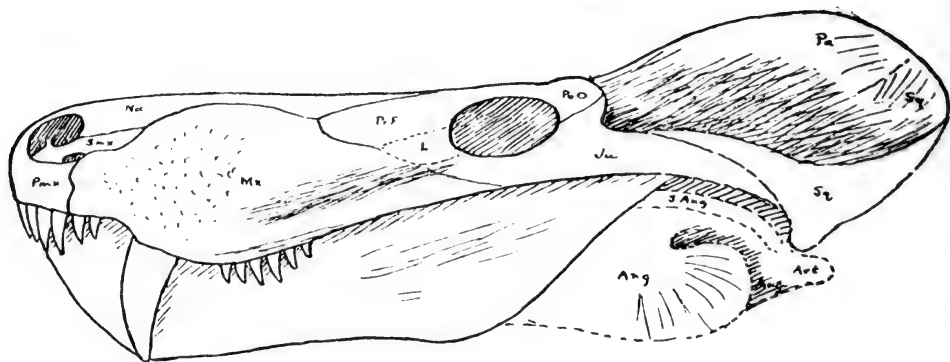
Scymnognathus tigriiceps Br. and Htn. is an *Endothiodon*-

zone form, but the general shape of the snout and arches differs much from that of *Scymnognathus Whaitsi*, and it clearly ought to be placed in a new genus; this has been done by Haughton in his recent paper where it is called *Aelurognathus tigriceps*. *Scymnognathus serratidens* Htn. is placed in the same genus.

Watson very shrewdly observes that "the forms from Dunedin and Nieuwveld localities are early, those from New Bethesda and the Kagaberg which are associated with *Dicynodon tigriceps* considerably later in time. There is, however, no stratigraphical evidence that this is so." Until I visited Dunedin four years ago, I regarded the Nieuwveld localities as belonging to the *Cistecephalus* zone. Possibly some do, but we know that Dunedin is in the *Endothiodon* zone, and probably fairly low in the zone. New Bethesda is probably a few hundred feet up in the *Cistecephalus* zone.

The Gorgonopsians at present described may be placed in the zones as follows:—

- Cistecephalus* zone. *Lycaenoides angusticeps* Br.
Ictidorhinus martinsi Br.
Sycosaurus laticeps Htn.
Lycaenoides minor Br.
?Arctops willistoni Watson.
Arctognathus curvimola Ow.
- Endothiodon* zone. *Aelurosaurus tenuirostris* Br.
Aloposaurus gracilis Br.
Asthenognathus paucidens Br.
Aelurognathus tigriceps Br. and Htn.,
A. serratidens Htn., *Scylacops*
capensis Br., *Gorgonognathus longi-*
frons Htn.
Aelurosaurus striatidens Br.
Scymnognathus whaitsi Br., *Gorgonops*
torvus Ow., *Aelurosaurus felinus*
Ow., *A. whaitsi* Br.
- Pareiasaurus* zone. *Scylacognathus parvus* Br.
Galesuchus gracilis Htn.



Pristerognathus vanderbyli Broom x $\frac{2}{5}$

PRISTEROGNATHUS VANDERBYLI sp. nov.

The genus *Pristerognathus* was founded by Seeley in 1894 on an imperfect snout discovered at Cypher near Tamboer Fontein. It differed from all previously known Theriodonts in having six upper and three lower incisors. Part of the maxilla is preserved, and its surface is stated to have been "sculptured with a fine sub-crocodilian ornament." As nothing else of the skull is known, it is difficult to decide whether to put all other specimens with six upper and three lower incisors in the same genus, or to regard the genus as indeterminate. In 1904 I described as belonging to the genus a very imperfect snout with similar dental characters but of very much smaller size under the name *Pristerognathus Baini*.

Recently, I have been able to examine quite a number of skulls and snouts that agree so closely with Seeley's type of *Pristerognathus polyodon* as to render it very highly probable that they belong to the same genus.

The finest skull I have seen belonging to this genus is one in the possession of Mr. W. A. van der Byl of Abraham's Kraal. It came from the hill on the west side of the Gamka River, about five miles S.W. of the Abraham's Kraal homestead. The skull is the most perfect Therocephalian skull known, though owing to the hardness of the matrix, the sutures in some parts cannot be clearly made out.

As Seeley's type is only an imperfect snout, it is extremely difficult to say in how far Mr. van der Byl's specimen differs. The latter is certainly from a much lower horizon, and we may safely regard it as belonging to a distinct species, but it agrees very closely in size with the earlier type. Mr. van der Byl's specimen differs in having the premaxillaries a little narrower and more pointed, the symphyseal portion of the lower jaw distinctly narrower, the canines lying in a true antero-posterior plane, and not as in Seeley's type with the posterior border directed considerably inwards. As Seeley's species is hardly determinable with certainty, it seems advisable to make Mr. van der Byl's specimen the type of a new species.

The skull is practically perfect, and only very slightly crushed from above downwards. The mandibles are also nearly perfect, but owing to the hardness of the matrix cannot easily be fully displayed. From the snout to the back of the squamosal, the skull measures 287 mm., and the greatest width across the squamosals is 160 mm. The orbits are relatively small and look mainly upwards. They have an antero-posterior length of 38 mm., and the anterior border is situated 140 mm. behind the front of the snout.

The upper incisors are six rounded pointed teeth each with a posterior serrated edge. The third and fourth teeth are the largest, the fifth considerably smaller than the fourth, and the sixth the smallest of the incisors. The six incisors measure 32 mm. Between the last incisor and the canine is a diastema of 11 mm. The canine has an antero-posterior measurement of 15 mm. It is a large flattened tooth which passes downwards and slightly forwards, and has a long posterior serrated edge. Behind the canine is a diastema of 15 mm. followed by six molars, which together measure 29 mm.

The snout in the canine region measures 58 mm. in width. One of the most interesting points in its structure is the septomaxillary bone. It is a narrow bone, resting in front on the premaxilla, and behind wedged between the maxilla and the nasal. There is a small foramen between the septomaxilla and the pre-

maxilla at the anterior end of the maxilla. There appears to be no process passing inwards towards the nasal cavity as in *Gorgonopsians*.

The nasal is broad in front, and very narrow behind, in this differing from the condition in the later *Therocephalians* and the *Gorgonopsians*. The prefrontal is large, and forms a considerable part of the upper surface of the snout. The frontals are narrow, but long. The interorbital width is 37 mm. There appears to be no post frontal. The parietals form a narrow high intertemporal crest. There is a large pineal foramen, situated a little behind the plane of the back of the postorbital arch. The jugal forms all the lower orbital border, and a considerable part of the postorbital arch. It passes backwards and forms about half of the jugal arch. The postorbital is relatively small. The squamosal is large and forms the whole of the back part of the temporal fossa. The quadrate region is not well seen. The lower jaw, though practically complete on both sides, does not show satisfactorily the details of the posterior elements, but must be very nearly as I show it on the figure.

I have named the species after Mr. W. A. van der Byl of Abraham's Kraal, to whom Palaeontology already owes so much.

PRISTEROGNATHUS VANWYKI sp. nov.

This new species is founded on an imperfect skull in the collection of the South African Museum which was found at Lammer's Kraal in the Prince Albert district. The skull is nearly complete but badly weathered. I have in my possession a second less perfect skull of the same species from probably the same locality.

The skull closely resembles that of *Pristerognathus vanderbyli* but is only about three-quarters of the size. The six incisors measure 26 mm. followed by a diastema of 8 mm. The canine measures 12.5 mm., and is followed by a diastema of 7.5 mm. The six molars measure 31 mm. It is remarkable that though the skull only measures in greatest length about 220 mm. as compared with 287 mm. in *P. vanderbyli*, the molars occupy a

longer space. The distance from the front of the orbit to the front of the snout is 110 mm. as compared with 140 in the larger species.

As in *P. vanderbyli* there is no postfrontal bone.

I have named this species after Mr. M. J. van Wyk of Kookfontein in the Prince Albert district, who is keenly interested in Palaeontology and to whom we owe the type of *Dinophoneus ingens* and some other interesting discoveries. There is no doubt that the type of the species is fully adult.

ALOPECODON MINOR sp. nov.

This new species is founded on a badly preserved and much crushed snout with much of both mandibles, found at Abraham's Kraal. Fortunately, the teeth of the right premaxilla and most of those of the right maxilla are well preserved, and they provide us with satisfactory characters.

When in 1908 I described *Alopecodon priscus*, I believed that the nine teeth in front of the large canine were eight incisors and one small canine. A re-examination of the type leads me to believe that the teeth are really seven incisors and two small canines: and pretty certainly in this new species we have also seven incisors and two small canines.

Of the incisors the first is small; the second larger, and the third still a little larger. The third, fourth and fifth are subequal. The sixth is about the size of the first, and the seventh a little smaller than the sixth. The seven incisors occupy a space of 26 mm. Behind the seventh incisor is a diastema of 3 mm. followed by two small canines each slightly smaller than the seventh incisor, and together occupying a space of 4 mm. At a distance of 5 mm. behind the second canine is the large canine which has an anteroposterior measurement of 7.5 mm. The canine in *Alopecodon priscus* is much flattened: here it is broadly oval in section. About 11 mm. behind the canine is the first of a series of seven molars. These seven occupy a space of 25 mm. In *A. priscus* there appear to be eight molars, and just possibly there may even have been nine; and though I can only find

seven in *A. minor*, quite possibly the first preserved molar is the second.

The specimen described by me in 1908 as *Alopecodon rugosus* probably does not belong to this genus. It is a very bad type.

ICTIDODON AGILIS gen. et sp. nov.

This new genus and species are founded on an imperfect skull discovered by me in the shales of the railway bank about a mile below Biesjespoort Railway Station. The specimen consists of the greater part of the left side of the skull, most of the left dentary, most of the premaxillaries, and much of the right maxilla. The whole of the top of the skull is lost. Fortunately most of the teeth are well preserved, and the upper dental formula can be given with practical certainty.

The small *Therocephalians* form a well marked group differing so much from the larger *Therocephalians* as to raise the question whether they ought not to be placed in a separate suborder. *Scaloposaurus constrictus* was described in 1876 by Owen. In 1911 I described *Ictidognathus parvidens*, and in 1912 *Ictidognathus Hemburyi*. In 1915 I described *Icticephalus polycynodon*. All these agree in having six incisors, two or three canines and eight to eleven molars, and in having all the teeth rounded and unserrated.

The present specimen differs from *Icticephalus* and *Ictidognathus* in having three canines, and from *Scaloposaurus* in having ten molars. There are six delicate elongated rounded incisors, apparently without any posterior serrations. The six together measure 8.5 mm. The sixth incisor is followed by a diastema of 1 mm. This is followed by two small canines about equal in size to the incisors and like them round and unserrated. The two together occupy a space of 3 mm. Following the second canine is a gap of 2.5 mm. with no functional tooth; but into this space a developing canine is about to appear. It may be called C. 3. The functional canine is a long rounded tooth whose base measures 2.8 x 1.8 mm. The tooth is grooved on the sides with shallow furrows. There is formed a slight posterior ridge but it is not serrated. The tooth from base to tip measures about

7 mm. Behind the fourth canine is a diastema of 2 mm., followed by ten small rounded pointed molars. These ten molars measure together 15.3 mm.

The skull when complete probably measured about 65 or 70 mm. From the front of the snout to the front of the orbit the measurement is 35 mm.

The zone of this type is most probably the very top of the *Endothiodon* zone, or, just possibly, the base of the *Cistecephalus* zone. *Cistecephalus* itself was found by me on a spot about three miles away on what must be very nearly the same horizon.

ICTIDOPARIA BREVIROSTRIS gen. et sp. nov.

This new genus and species is founded on an imperfect skull found at Lammerskraal in the Prince Albert district and in beds of the lower *Pareiasaurus* zone. It occurs in association with *Dicynodon Jouberti* Br. and *Pristerognathus vanwyki* Br. The skull has lost the snout anterior to the large canine, and the whole of the occiput behind the pineal foramen; but otherwise is fairly well preserved.

The skull is long and narrow, and probably measured about 62 mm. in length and 38 mm. in width. The length of the orbit is 15 mm. and from the front of the snout to the front of the orbit about 25 mm. The nasals appear to have been narrow and the prefrontals large. The maxilla has a large canine measuring at the base 3 mm. x 2 mm. Whether there were any other small canines in front, the specimen does not show. I do not think there can have been more than one small canine in front of the large one preserved; and I think it more probable that there is only a single canine. The molars are badly preserved. There appear to be ten, measuring together 12.5 mm., and the first is situated 1.5 mm. behind the canine. The frontals are long and narrow. The interorbital width is about 12 mm. There appears to be no distinct post-frontal, but the post-orbital is well developed.

The parietals are small, but apparently do not form as in the larger Therocephalians a high sagittal crest. There is a small pineal foramen.

The dental formula is probably $\begin{array}{ccc} ? i. 6 & ? c. 1 & m. 10. \\ \hline ? i. 3 & c. 1 & m. 10. \end{array}$

The mandible is long and slender.

NOTOSOLLASIA LATICEPS gen. et sp. nov.

I am founding this new genus and species on a skull discovered by me near Bethesda Road Railway Station. The skull has the frontal and parietal region and some other parts of the upper surface badly weathered but is otherwise fairly complete.

The skull measures about 216 mm. in length and 164 mm. in width. The snout is wide and rather blunt. On each side there are four relatively small rounded incisors with fairly long crowns down which run at least on the anterior surfaces a number of longitudinal grooves. Apparently there are no posterior serrated ridges. The four incisors together measure 18 mm. Behind the fourth incisor is a diastema of 8 mm. followed by a relatively small rounded canine measuring 8 mm. in each diameter. The crown is not sufficiently preserved to enable one to say whether the canine is grooved near the point as are the incisors. The basal portion is ungrooved, and there is no posterior serrated edge. Behind the canine, there is no trace of any molars in either upper or lower jaws, and yet the specimen is perfectly satisfactorily preserved and the animal does not appear to be aged, the incisors being in good condition.

Elsewhere, I intend to describe this skull in some detail with a number of figures, as it represents a new type of Therocephalian. It seems to be most nearly related to *Whaitsia platyceps* Houghton, though apparently it belongs to a distinct family.

The horizon of the fossil is probably some hundred or two hundred feet up in the *Cistecephalus* zone.

I have named this interesting new type after my friend Prof. W. J. Sollas, F.R.S., who has distinguished himself in so many different fields, and whose abiding infectious enthusiasm one cannot but admire.

LYCAENOPS ORNATUS gen. et sp. nov.

This and the following three new forms have all been discovered by me in the neighbourhood of Biesjespoort Station. I have on hand at present a monograph on the Gorgonopsia and in it I intend to fully illustrate these new types, but as the publication will probably not take place for a couple of years, I think it well to issue these preliminary descriptions.

The form which I am calling *Lycaenops ornatus* is represented by a nearly perfect skeleton. The skull is complete but slightly crushed. Six of the cervical vertebrae are lost but the dorsals and sacrals are complete, and two caudals are preserved. The shoulder girdle of the left side and part of that of the right side are preserved with the ossified sternum. Both fore limbs are preserved in nearly perfect condition, as are also both hind limbs with both sides of the pelvis. Hitherto, though a good many Gorgonopsian skulls have been known, nothing has been known of the post-cranial skeleton, except the cervicals and fore limb of *Aelurognathus tigriceps* and a very few bones of *Scylacops capensis*.

The skull is long, narrow and deep. The length from the snout to the occipital condyle is 178 mm. The greatest width across the squamosals is 118 mm. From the front of the snout to the front of the orbit the measurement is 115 mm. The interorbital measurement is 46 mm. and the intertemporal 58 mm. The preparietal is very large, subrectangular in shape, and measures 30 mm. in length and 14 mm. in width.

There are five incisors, one canine, and four molars. The incisors measure together 33 mm. and are followed by a diastema of 11 mm. The canine is exceptionally long and narrow. The anteroposterior measurement is only 10 mm. and yet from the tip to the base it is probably over 50 mm. in length. Behind the canine is a diastema of 13 mm., followed by four small molars which measure together 19 mm. The molars are subequal.

CYNARIOPS ROBUSTUS gen. et sp. nov.

Of this new genus and species I have three specimens. The first, which will be regarded as the type, is a good skull without

the lower jaw and lacking both squamosal regions, and with most of the premaxillaries weathered away. The second specimen consists of a number of bones of a crushed skull including both maxilla, left nasal, and left dentary. The third specimen is a beautifully preserved skull of a young animal, only about half the size of what I regard as adult skulls. The base of this skull I have had sectioned into thin slices, and it is this specimen which has revealed the fact that the suppressed median plate of the basisphenoid, and in reality all that part of the base of the skull that was supposed to be the basisphenoid, is really the true mammalian vomer.

The type skull when complete probably measured 135 mm. in length and about 90 mm. in breadth. The preparietal is sub-lozenge shaped, 18 mm. long and 11 mm. broad.

The dental formula is I. $5/4$, C. $1/1$, M. $4/4$.

The five incisors of the premaxilla must have measured about 20 mm., though owing to the first two being weathered away an exact figure is impossible. The third, fourth, and fifth together measure 13 mm. Following the last incisor is a diastema of 14 mm. The canine at its base measures 9 mm. by 5 mm. In specimen 2, the canine from the tip to base measures 25 mm. Behind the canine is a diastema, which in specimen 2 measures 4 mm.: in specimen 1 measures on the one side 2 mm., and on the other 5 mm. This is followed by four molars which together measure from 12 to 13 mm. The fourth molar is much smaller than the others. The interorbital measurement is 36 mm.

All the specimens were got on a horizon which is on the very top of the *Endothiodon* zone, about 100 feet below the horizon of Biesjespoort Station.

CYNARIOIDES TENUIS gen. et sp. nov.

This new genus and species is represented by a badly crushed skull of an immature form discovered by me about half a mile west of Biesjespoort Station, and on a horizon which must be about 100 feet higher than that of the *Cynariops robustus*, and pretty certainly in the *Cistecephalus* zone.

The skull probably measures about 110 mm. in length, and

from the snout to the front of the orbit about 56 mm. The preparietal is lozenge-shaped, and measures in length 15 mm. and in breadth 9 mm. The interorbital width is about 24 mm. and the intertemporal about 30 mm.

The five incisors measure 14 mm. There are two canines—the posterior of which is being replaced by the anterior, which is slightly interior to it as well as in front. It is the anterior one which is the permanent canine of the adult forms. The posterior becomes ultimately eaten into and displaced by the root of the anterior canine. In the practically adult specimen of *Cynariops robustus* there are portions of the posterior canines still seen. There are five molars, and this necessitates the species being placed in a distinct genus from *Cynariops* which has only four molars, though the two genera are undoubtedly nearly related. The five molars measure 13 mm.

LYCAENODON LONGICEPS gen. et sp. nov.

This new genus and species are represented by the greater portion of one skull and a few portions of a second. The specimens are from a horizon about 100 feet above the level of Biesjespoort Station, and thus well within the *Cistecephalus* zone.

The type skull has the front of the incisor region weathered off, and lacks the whole of the occipital, parietal, and squamosal regions, but otherwise is well preserved. When perfect, the skull probably measured about 180 mm. from the occipital condyle to the snout. From the front of the snout to the front of the orbit, it measures about 100 mm. A small portion of the preparietal is preserved, sufficient to show that the preparietal was a small, very narrow bone. The interorbital measurement is 43 mm.

There are five incisors which measure together about 16 mm. The fifth is much smaller than the others. Behind the fifth, is a diastema of 10 mm., followed by a relatively small canine which has a basal measurement of 9.5 by 5.5 mm. Behind the canine is a diastema of 11.5 mm.; and this is followed by six molars placed at a little distance from each other. Together they measure 27 mm. on one side, and 28 mm. on the other.

The second molar is the largest, and the fifth and sixth are relatively small.

This specimen is of value as showing not only the palatal structure, but the prevomerine plate and practically all the details of the structure of the ethmoid. The second fragmentary specimen shows beautifully the structure of the vomer and the epipterygoids.

On the Pelvis and Sacrum of *Dicynodon*.

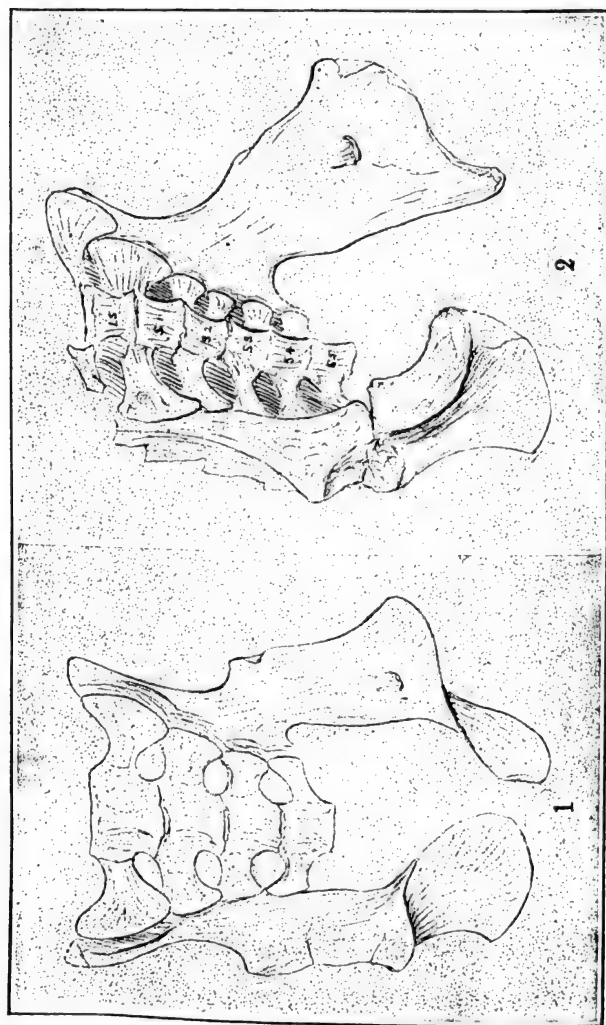
By R. BROOM, D.Sc., F.R.S.

Though the skeleton of *Dicynodon* has been for long fairly well known there are a few points on which there is still some doubt. Some dozens of good skulls are known and many have been figured, but no really good pelvis has as yet been described and figured, and so far as I am aware very few are to be met with in any museum. The British Museum has a fairly good pelvis of *Platypodosaurus robustus*—perhaps the same animal as Owen named from a skull *Oudenodon magnus*. This specimen, though it has a well preserved ilium and most of the pubis and ischium, is imperfect below and does not show us whether there was a symphysis. Other specimens also fail to show us the nature of the symphyseal region. Watson, in briefly describing his specimen of *Dicynodon Halli*, says, "as is clearly shown in many specimens in the British Museum, there is no symphysis between the two pubes and the two ischia in *Dicynodon*."

Though I suppose I may claim to have handled more specimens of *Dicynodon* than anyone else, I have never seen a specimen that quite satisfied me as to the condition of the symphysis. In most specimens, the ilium, pubis and most of the ischium are preserved as if they had been loosely attached to the sacrum and had become easily detached. In *Kannemeyeria* the lower borders of the ischium and pubis look as if these bones had not formed a median symphysis. But many other specimens of the *Dicynodont* pelvis suggest that there may have been a loose symphysis. Watson discovered a symphysis in *Lystrosaurus*. He says, "the ischium is a large bone, meeting its fellow of the opposite side in a short symphysis and then widely separated from it behind."

Recently, I discovered the almost perfect pelvis of a small *Dicynodont*, almost certainly *Dicynodon Sollasi*, though not associated with the skull, and this specimen seems to show that at least in some species of *Dicynodon* there is a feeble symphysis.

The sacrum consists of four vertebrae closely and probably immovably articulated but not completely ankylosed. Each has a well-developed sacral rib very closely articulated to the centrum



1. Pelvis and sacrum of small *Dicynodon*, believed to be *D. Sallusi* Br. Nat. size
The specimen shows an ischial symphysis and no lumbo-sacral vertebra
2. Same of *Dicynodon Andreusii* Br. $\times \frac{1}{4}$
L.S. Lumbo-sacral vertebra. S1, S2, etc. Sacral vertebra

and probably ankylosed to it, though the line of union can still be seen. The first sacral rib is much the largest, and it supports

about the anterior third of the ilium. The second rib, though also well developed, has an articulation with the ilium of only about half that of the first rib. The third and fourth sacral ribs are relatively small. Watson suggests that of the six sacral vertebrae in *Lystrosaurus*, the first is a sacrolumbar, the next two true sacrals, and the last three sacro-caudals. In *Dicynodon sollasi* the first two are I think undoubtedly true sacrals and the third and fourth are probably to be regarded as sacro-caudals.

The ilia present no special noteworthy features not previously known.

Though the pubes and ischia are somewhat crushed, the drawing shows clearly the arrangement of the bones. The pubic anterior border passes downwards and backwards from the articulation with the ilium for a distance of about half the length of the anterior border of the ilium, and ends abruptly in a moderately sharp process. From this point, the border of the pubis passes almost directly inwards and forms the front border of the pelvic brim, being continued into the anterior and inner border of the ischium.

The ischium is a much larger element than the pubis. Posteriorly it forms a large ischial tuberosity. From the outer and posterior corner of the tuberosity, the posterior border passes inwards and downwards till it apparently meets its neighbour in a short, feeble symphysis. Though in the specimen the two ischia do not meet, there is I think little doubt but that there was a ligamentous union, and one of the ischia shows what looks like a definite articular border.

The left femur lies almost directly outwards from the acetabulum with the tibia turned directly backwards. The right femur passes almost directly forwards and the right foot was folded back so that the plantar surfaces of the tarsus lay on the upper end of the femur.

Another pelvis and sacrum in my possession, belongs to a skeleton which may be referred with much probability to *Dicynodon Andrewsii*. Though very badly crushed it is of considerable interest, and it differs very considerably from the pelvis of *D. Sollasi*. The sacrum consists of apparently six, and possibly

seven vertebrae, and of the six or seven it is manifestly the second, third, fourth and fifth, which correspond to the four sacral vertebrae in *D. Sollasi*

The first vertebra is not ankylosed to the second, but its rib gives a considerable support to the anterior corner of the ilium. This rib is a much feebler structure than the ribs of the true sacral vertebrae. From a slender inner portion it becomes on passing outwards a wide, flat, fanlike structure. There is no doubt that this first vertebra is a lumbo-sacral vertebra. The second vertebra is the first true sacral vertebra. It has a large, powerful, sacral rib which articulates with the ilium in a very similar manner to the rib of the first sacral in *D. Sollasi*. This second vertebra is not completely ankylosed to the third. The third, fourth, fifth and sixth vertebra appear to be ankylosed: the seventh possibly not. The third, fourth and fifth vertebrae have subequal sacral ribs. The sixth sacral rib is not completely preserved.

Each side of the pelvis is badly crushed; but, while the right side has the bones crushed together, the bones of the left side are crushed flat. The ilium is of the well-known *Dicynodon* shape. Towards the posterior end of the crest, there is a little notching such as Watson found in *Lystrosaurus* but much less marked. The pubis is very short in comparison with the ilium. The ischium is also short and much narrower than in *D. Sollasi*. As preserved, the two sides of the pelvis are wide apart, and there cannot hardly have been a bony symphysis. There may have been a wide ligamentous one.

From these two specimens of *Dicynodont* pelves, it is seen that in some forms there is a symphysis: in others no symphysis. Possibly the difference is specific. Perhaps it is sexual. The pelvis of *D. Andrewsii* is a female skeleton. Possibly *Dicynodon* was oviparous, laying large, hard-shelled eggs and the female pelvis loosely articulated and with a ligamentous symphysis to admit of the passing of the egg. We know in tortoises the bony structure differs very appreciably in males and females. It is interesting to note that Watson's *D. Halli* in which there is no symphysis is also a female.

ADDENDUM.

Since this was submitted to the press, Dr. S. H. Haughton has called my attention to the close similarity in measurements between the type of *Pristerognathus vanderbyli* sp. nov. and that of *Alopecognathus angusticeps* Br. The similarity in size and tooth measurements I had carefully considered and am quite prepared to agree that they may be congeneric, but *Alopecognathus angusticeps* occurs at a very much higher horizon and the general shape of the skull at the back is very markedly different.

**Descriptions of two new species of the Genus *Acontias*
and notes on some other lizards found in the Cape
Province.**

By R. ESSEX, B.Sc.

[With two text figures.]

ACONTIAS BREVICEPS sp. nov.

Snout rounded and very short: fronto-nasal half as long as the rostral, which is no longer than the frontal; three supra-oculars, the first nearly as large as the other two together, four supraciliaries; interparietal longer than broad. Eighteen scales round the body; 31 series of sub-caudal scales. Body five and a half times length of tail. Tail does not taper; tip of tail rounded. Width of large anal plate equal to distance from interparietal to tip of snout. Colour, olive green throughout; the anterior half of each scale dirty yellow, posterior half dark olive brown. On the back dark olive brown predominates, on the belly the yellow predominates. Remnants of pectoral girdle not as degenerate as in other species; scapulo-coracoids continuous, and clavicles present.

Measurements of three type specimens:

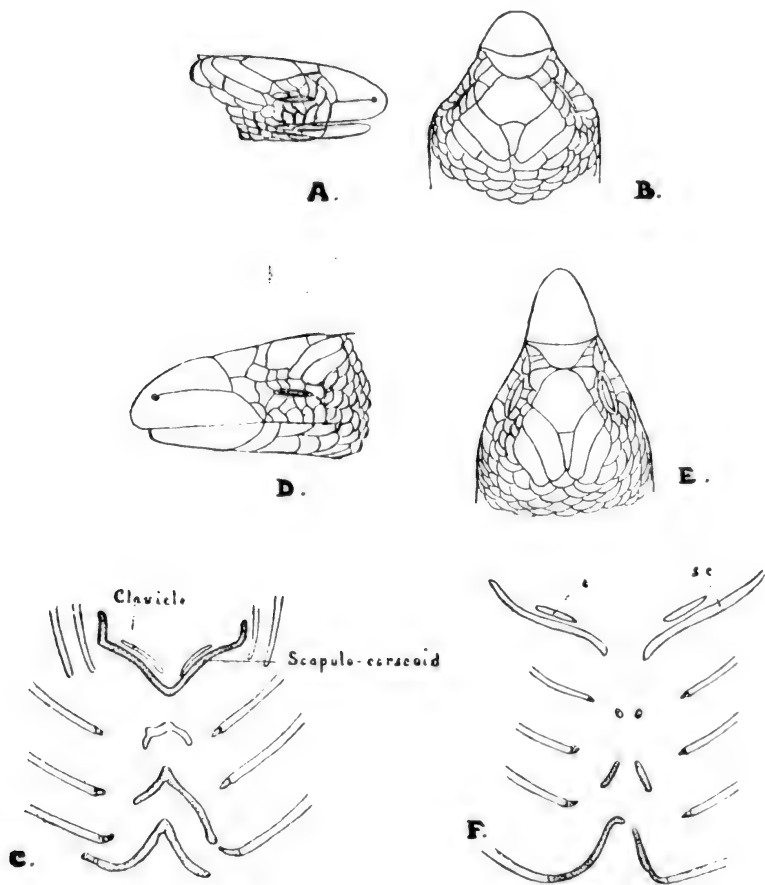
From snout to vent 175 mm. 170 mm. 105 mm.

Tail 33 mm. 32 mm. 18 mm.

Locality: Hogsback, Amatola Mountains, altitude 6,000 feet, collected by myself, September, 1924. Types in the Albany Museum, Grahamstown.

Acontias breviceps differs from *Acontias meleagris* as follows:—1, in the very short head. 2, in the shape of the parietals, which in *breviceps* have parallel sides. 3, the narrower interparietal. 4, the scales immediately behind the parietals are wide in *meleagris* but in *breviceps* are like the adjoining scales. 5, *breviceps* is uniformly coloured, whereas *meleagris* is always yellow ventrally. 6, less degenerate pectoral girdle (descriptions of this character in the various species will be published shortly).

The habitat of this species is a stony ridge on the Amatola range at an elevation of about 6,000 feet. In the near vicinity I found also:—*Tropidosaura montana* (1), *Tetradactylus laevi-*



A & B Head of *Acontias breviceps* sp. nov.

C Pectoral girdle of same

D & E Head of *Acontias gracilicauda* sp. nov.

F Pectoral girdle of same

cauda (2), *Zonurus cordylus* (6), *Oedura amatolica* (3), *Pseudocordylus microlepidotus* (2) and a single specimen of the Onycophoran *Peripatopsis moseleyi*. Two specimens were found under stones and the third on the road which crossed the mountain. The latter specimen was dead, having been killed by a blow on the head, probably being mistaken for a snake. The two other specimens were at first lethargic, but became quite active after a few minutes. All species of *Acontias* which I have noticed burrow very quickly, but when placed on a surface where burrowing is not possible they progress by a series of lateral whip-like movements which appear rather aimless and resemble to a great extent the movements of the small snakes *Glauconia* and *Typhlops*.

ACONTIAS GRACILICAUDA sp. nov.

Head conical, fronto-nasal half as long as rostral, which is longer than the frontal; three supraoculars, the first of which is larger in area than the other two together; four supraciliaries. Interparietal twice as long as broad, and completely separating the parietals. Eighteen scales round the middle of the body; 35 series of sub-caudal scales. Length of tail one-sixth of total length; tail tapering rapidly, even more rapidly than in *plumbeus*.

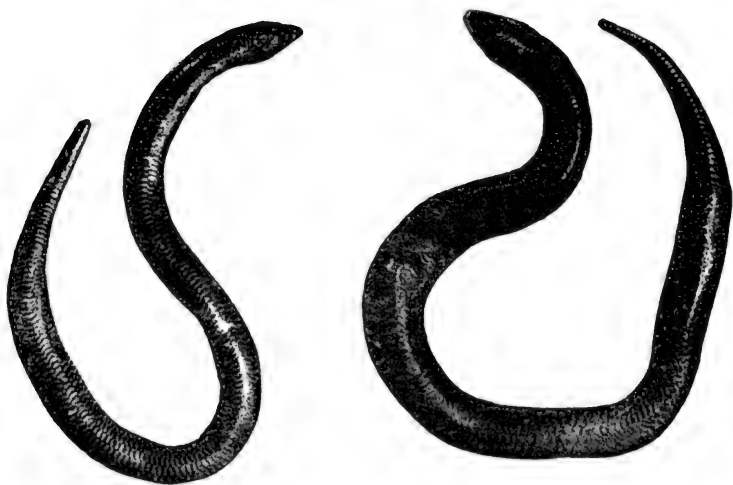
Colour uniform leaden above, dirty yellow ventrally.

Scapulo-coracoids present in pectoral girdle but do not meet; clavicles present.

From snout to vent 224 mm., tail 44 mm., breadth of body 10 mm., of tail (5 mm. from end) 3 mm.

Type from Grahamstown. Altitude 1,800 feet.

In addition, there are in the Albany Museum two specimens, No. 3,955 from Carolina and No. 2,561 from Alicedale, both of which seem to be referable to *Acontias gracilicauda*. *Acontias gracilicauda* differs from *A. plumbeus* as follows: in a much shorter head: in having an interparietal which completely separates the parietals: and in *plumbeus* the paired vertebral scales of the four transverse rows immediately behind the interparietals are much wider than in *gracilicauda*. Peters in his *Reise nach Mossambique* (III, 1882), Taf. XII, figs. 5 and 6, gives drawings



Acontias breviceps sp. nov. (left), and *Acontias gracilicauda*
sp. nov. (right), x .65

of the pectoral and pelvic girdles of *Acontias niger* and also a drawing of the complete animal. He then considered *niger* to be synonymous with *plumbeus*, but a comparison of Peters' drawing with that of the type of *plumbeus* as given by Bianconi in Specimina Zoologica Mosambicana 1850 (Reptile, Tab. 2, fig. 1) will show that these two are not the same. *A. niger* has a much shorter head and a shorter and stouter tail, and moreover Peters' figure of the pectoral girdle does not agree with my dissections of specimens which conform well with Bianconi's figure and description of *plumbeus*. In Peters' drawings, the two halves of the girdle are not continuous; my dissection of *plumbeus* showed them completely separate. Judging from the figure of *A. niger* and from the similarity of the girdle to that of *A. breviceps* (fig. C.), it is even possible that Peters' species *niger* is nearly related to *A. breviceps*, but is certainly not synonymous with *A. plumbeus*.

I take this opportunity of emphasising the importance of the remnants of the girdles in degenerate lizards and some snakes as specific characters. In a paper about to be published

I propose to deal with the matter in detail as regards the girdles of *Glauconia*, *Typhlops*, *Acontias*, etc.

In these notes I record the results of three years' collecting in the Cape Province. Much of the collecting has of necessity been done in the neighbourhood of Grahamstown, but various trips have been undertaken, to the Amatola Mountains, to the Karoo and Zitzikamma Mountains, and to the Cape Peninsula, visiting en route the Outeniqua Mountains and the Hottentot Hollands Mountains, etc.

This is by no means a complete record of the lizards found in those regions, but is offered as a contribution to a somewhat neglected line of nature study.

Family GECKONIDAE.

PACHYDACTYLUS MACULATUS Gray.

Amatola Mountains, Fort Beaufort, Grahamstown, Port Elizabeth, Hermanus.

This gecko is fairly common in the Eastern Province and is usually found under stones, often in conjunction with *Zonurus cordylus* or with scorpions. There is a common but erroneous opinion that it is poisonous. It is a timid and rather friendly lizard and can easily be kept in captivity when provided with small insects. It is oviparous and the eggs are usually laid in pairs although on one occasion I found a cluster of thirteen eggs. These eggs hatched out three weeks after being collected. The young average 20 mm. in length, are blackish in colour and the tail is quite thin. When captured the adult has a habit of losing its tail and the regenerated tail is much wider than the original one. Also when caught it often emits a distinct squeak.

PHYLLODACTYLUS PORPHYREUS Daud.

Cape Peninsula (Kirstenbosch and Constantia).

This gecko is much larger than the preceding one and may reach a length of 100 mm. The young are dark brown with long reddish tails and when hatched measure 30 mm. The adults are greyish with dark brown variegations above and a grey stripe down the centre of the back from the neck to the base of the tail. They are much more active than *Pachydactylus maculatus*,

On January 2nd, 1925, I collected twenty-four eggs of *P. porphyreus* at Constantia in the Cape Peninsula. There were thirteen in one cluster, eight in another and three in the other. During the ensuing motor journey of one thousand and more miles seven were broken. On February 5th seven hatched out and a few days later six others. The young were at first covered with a thin transparent membrane. This vanished shortly and judging from the fact that I found no trace of it, it is highly probable that it constitutes the young gecko's first meal.

PHYLLODACTYLUS ESSEXI Hewitt.

Houndslow, 10 miles north of Grahamstown.

The adult has a superficial resemblance to the young of *P. porphyreus*. It was found on a rocky hill and on the same hill I have taken *Zonurus cordylus*, *Eremias pulchella*, *Mabuia varia*, *Acontias meleagris* and *Typhlops delalandii*.

OEDURA AMATOLICA Hewitt.

Hogsback on the Amatola Mountains. Three specimens were found under stones at a height of about 6,000 feet. In this neighbourhood, where I collected very carefully, no trace of *Pachydactylus* or *Phyllodactylus* was found.

Family AGAMIDAE.

AGAMA ATRA Daud.

Amatola Mountains, Fort Beaufort, Grahamstown, Port Alfred, Port Elizabeth (Schoenmakers Kop), Hermanus, Houw Hoek, Sir Lowry's Pass, Cape Peninsula, Bains Kloof, Tradows Pass and Mossel Bay.

This lizard has a very wide distribution. It can be found on the sea shore, on the Karoo and on the tops of mountains. On the sea shore at Hermanus I have found it in fairly large numbers on rocks which are covered at high tide. In the breeding season, the head of the male becomes a vivid blue. It always inhabits the neighbourhood of large stones and is extremely difficult to catch owing to its quickness and to its power of jumping. I have seen an adult Agama jump to a height of twelve inches and land on the perpendicular face of a rock; and I have seen another adult when hard pressed leap with its legs and toes outstretched

to a point on another rock two feet lower and three feet away from the point where it was standing. These lizards usually bask in the sun and they have a quaint habit of raising and lowering the head and shoulders at the same time turning the head from side to side. They watch intently anything approaching from the front, and if one attracts their attention in this manner, a second person can often easily capture them from the rear.

Family ZONURIDAE.

ZONURUS CORDYLUS Linn.

Hogsback (Amatola Mountains), Gaika's Kop (Amatola Mountains), Mitchel's Pass (Seymour), Fort Beaufort, Port Alfred, Port Elizabeth, Hermanus, Houw Hoek, Hottentots Holland Mountains, Sir Lowry's Pass, Cape Peninsula, Bains Kloof, Montagu.

This is probably the commonest lizard in the coastal districts of the Cape Province. I have taken it from the sea shore to Gaika's Kok at a height of 6,000 feet. It also seems to be the hardest. Lizards are usually considered to be almost entirely insectivorous, but on one occasion I saw a *Z. cordylus* attack and eat a small skink. It lives in narrow cracks between rocks and owing to its dorsi-ventral flattening it can squeeze into very narrow clefts and is hard to dislodge. At Hermanus, *Zonurus* appears to have departed somewhat from its rupicolous habits and there often lives in holes in the earth after the manner of *Gerrhosaurus flavigularis*. While collecting on a trip from Grahamstown to Capetown I noticed that specimens taken in the Eastern Province and the South-Eastern Districts were all reddish with yellow variegations: at Hermanus most of the specimens had black heads and as one proceeded westwards they became blacker until in the neighbourhood of Capetown most of the specimens taken were entirely black. It is possible that on a closer examination it may be found that there are two or several varieties.

PSEUDOCORDYLUS MICROLEPIDOTUS Smith.

Amatola Mountains, Grahamstown.

This is a comparatively rare lizard. Its habitat appears to be very similar to that of *Zonurus cordylus* since in both places where I have taken the former, I have also taken the other. At Hogsback I twice observed this species in the act of feeding on a rock-encrusting lichen.

ZONURUS COERULEO-PUNCTATUS Hewitt and Methuen.

This species somewhat resembles *Z. cordylus* but is slenderer and marked with bright blue spots: it is deep yellow ventrally. I found it living in the wall on the Montagu Pass in the Outeniqua Mountains. It basks in the sun but is extremely hard to catch. In a distance of a mile along the wall I counted thirty specimens of *Zonurus coeruleo-punctatus* of which three were captured, one *Tropidosaura montana*, and one *Mabuia varia*.

CHAMAESAURA ANGUINA Lin.

Coldspring (six miles west of Grahamstown), Woest Hill (four miles south-east of Grahamstown), Bains Kloof, Cape Peninsula.

This serpentiform lizard has minute remnants of limbs and a very elongated tail. Most of the surface frequenting serpentiform usually live in grassy country, but of the five specimens of *C. anguina* I have taken, two were taken in rocky country. The Bains Kloof specimen was gliding over the flat surface of a large rock and its motion was so snake-like that at first I mistook it for a specimen of *Psammophis crucifer*.

I have watched these lizards for any sign of limb movement and so far have not been able to detect any. There is a distinct difference between the movement of the surface frequenting serpentiform lizards and the burrowing serpentiform types. The former are typically snake-like and particularly graceful in their movements. The short-tailed burrowing forms, such as *Acontias*, move jerkily with a lateral whip-like movement.

Family GERRHOSAUROIDAE.

GERRHOSAURUS FLAVIGULARIS Wieg.

Grahamstown, Botha's Hill (eight miles north-east of Grahamstown), Port Elizabeth (Schoenmakers Kop), Hermanus.

At Port Elizabeth and Hermanus *G. flavigularis* was found

on the shore living in holes under bushes in close proximity to *Zonurus cordylus*, *Mabuia varia* and *Mabuia homalocephala*.

Its throat is yellow and it has a narrow but very distinct yellow band arising above the posterior corner of the eye and running the length of the body. The sides, especially of the neck, are barred with black and yellow and the back is variegated with black markings and small yellow dots. *G. flavigularis* is distinctly untamable and attempts to bite whenever possible. Crickets seem to be the favourite food, as I have ascertained by actual dissections.

TETRADACTYLUS SEPS Lin.

Cape Peninsula.

This lizard has a deep olive bronze colour on the back and ventrally a metallic iridescence. The upper lip has yellow spots not quite so plainly marked as in *Tetradactylus tetradactylus* where the markings are continued along the neck. It lives under stones and appears from its proportions to be in the first stages of serpentiform degeneration.

TETRADACTYLUS LAEVICAUDA Hewitt.

Amatola Mountains.

This is very similar in colouration and also in habit to *T. seps*, but the tail is proportionally longer.

TETRADACTYLUS TETRADACTYLUS Lacep.

Cape Peninsula.

T. tetradactylus resembles in proportion and habit *Chaemaesaura anguina* except that in *C. anguina* degeneration has proceeded much further and whereas in *Chaemaesaura* the limbs do not appear to be of use, in *T. tetradactylus* they are used to a certain extent. For the most part the animal glides along with a serpentiform movement but when at rest it sometimes raises itself from the ground by means of its limbs. It is impossible to say whether the limbs move as it glides along since the rate of progress is too rapid.

Family SCINCIDAE.

MABUIA TRIVITTATA Cuvier.

Amatola Mountains, Fort Beaufort, Grahamstown, Port

Elizabeth, Hermanus, George, Mossel Bay, Caledon and Cape Peninsula.

This lizard is fairly common over a wide area and I have rarely found it far away from houses. I have found it living on garden rockeries, in holes in the trunks of trees and under bushes. When fully grown it has rather a heavy body and is by no means as agile as the Lacertids. On the Amatola Mountains it was taken near to the Hogsback Hotel.

MABUIA HOMALOCEPHALA Wieg.

Grahamstown, Hermanus, Cape Peninsula.

This and *M. varia* are very similar in general appearance. Each has a lateral streak passing through the ear, but in *M. homalocephala* this streak is often yellow and is edged inferiorly with a dark band which is again edged with a whitish band; also in *M. homalocephala* the hind limb will barely meet the adpressed forelimb whereas in *M. varia* it invariably covers the hand and often more. There is also a difference of habitat for *M. varia* lives often under bushes, whereas *M. homalocephala* is entirely rock frequenting.

MABUIA VARIA Peters.

Grahamstown, Port Elizabeth, Hermanus, Cape Peninsula.

SCELOTES BIPES Lin.

Cape Peninsula.

The fore limbs are entirely absent and as the animal moves the small hind limbs are kept close to the body: it is found burrowing in loose earth and has a more snake-like movement than *Acontias* mainly owing to its longer tail.

Family LACERTIDAE.

TROPIDOSAURA MONTANA Dum and Bibr.

Amatola Mountains, Grahamstown, Montagu Pass in the Outeniqua Mountains.

Found only on rocky hills or mountains. On the summit of Signal Hill, Grahamstown, this is apparently the only lizard and is fairly plentiful. As one proceeds lower down the same ridge other species such as *Pseudocordylus microlepidotus*, *Zonurus*

cordylus, *Eremias burchelli*, *Acontias meleagris* appear: at this lower elevation *Eremias burchelli* becomes plentiful whilst *Tropidosaura* completely vanishes, but on ascending the next spur of the Zuurberg, *Tropidosaura* again appears.

On the Amatola Mountains the same sequence did not hold good since I found *Tropidosaura* in close proximity to most of the species mentioned previously, while in the Montagu Pass it shared a wall with *Zonurus coeruleo-punctatus*.

Boulenger says of the colouration: "olive brown above with two dark and two light longitudinal streaks on either side." To this might be added: the light streaks in the breeding season become series of bright yellow dots.

NUCRAS DELALANDI M. Edw.

Sugarloaf Hill, Grahamstown. Only once taken.

NUCRAS TESSELLATA TAENIOLATA Smith.

Longford Grange on the Bushman's River, 30 miles south of Grahamstown.

The colouration is somewhat similar to that of *Eremias burchelli* with the exception that the tail in the adult of *Nucras* is red for some distance from the tip whereas in *Eremias* the young only have red tails. Found in bush near to the river.

EREMIAS BURCHELLI D. and B.

Grahamstown: at various places on the range of hills to the south and west of the town. The favourite habitat is ground dotted with loose stones. It is extremely quick and very hard to catch. Sometimes it is very plentiful and I have captured eight in less than an hour. One nearly always finds *Trimerorhinus rhombeatus* in the same small locality and it seems as though this snake is one of the natural enemies of *Eremias*.

EREMIAS LINEOCELLATA PULCHELLA Gray.

Hounslow, 10 miles N.E. of Grahamstown, Avontuur, Riversdale. Frequents sandy stretches with some stones. It is probably the quickest of all the small lizards.

SCAPTEIRA KNOXI M. Ed.

Cape Flats. Frequents the extensive sandy wastes to the east of the Cape Peninsula.

**On some new species of Reptiles and Amphibians
from South Africa.**

By JOHN HEWITT.

[With Plates XV-XIX.]

Order LACERTILIA.

Family GECKONIDAE.

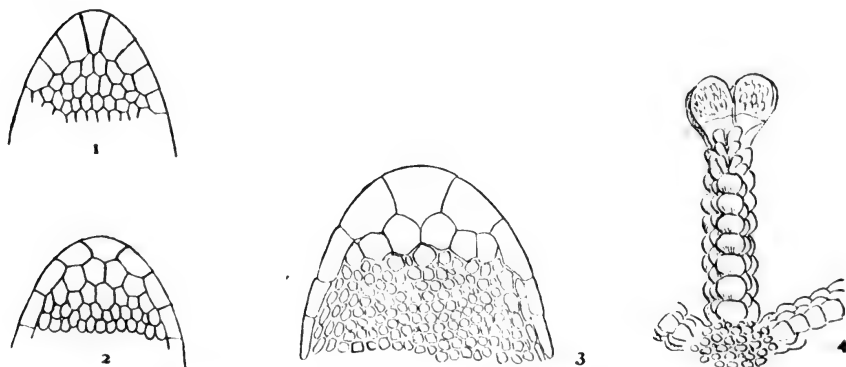
PHYLLODACTYLUS ESSEXI sp. nov. [Pl. XV, fig. 2.]

This species is described from two examples found under large stones on a kopje at the farm Hounslow, near Grahams-town, September, 1924, the larger one adult male (coll. J. Hewitt) and the smaller one juvenile (coll. Miss M. L. Winslow). With this rare little gecko I have pleasure in associating the name of Mr. Robert Essex, B.Sc., who has added considerably to our knowledge of reptile habits and anatomy.

The species is related to *lineatus* Gray, which seems to be confined to the Western districts of the Cape Province. No precise locality was indicated for the type of *lineatus*, but one may regard as typical a specimen collected at Tulbagh, and now in the South African Museum (No. 8,056): this conforms well with the descriptions of Gray, Smith, and Boulenger. *P. essexi* differs markedly from *lineatus* in the shape of the head which is long and flattened, instead of "rather short and deep" as Smith described, or very convex (Boulenger): also, the rostral shield is wider and lower, being subrectangular rather than "sub-pentagonal," and there are differences in the form of the mental shield, and in the number of supralabial scales.

Head elongated, and flattened, snout rather pointed, at least $1\frac{1}{2}$ times as long as the diameter of the orbit, about equal in length to the distance between eye and ear. Ear opening oval. Head covered with slightly flattened convex granules which are largest on the snout: rostral quite twice as broad as high, sub-rectangular, the median cleft extending to the centre: nostril bordered by three nasal scales, the rostral, and the first labial: anterior nasal scale by far the largest, separated from its fellow

by a single granule, the two other nasals a little larger than the adjoining scales; seven upper labials, 5-7 being suboculars; six lower labials; mental sub-pentagonal, broader than the first labial at the base, narrowing towards the apex and thus a trifle narrower there than the first labial: a row of about six chin-shields, the two middle ones a little larger than their neighbours. [Text fig. 3.] Dorsal scales of body with smooth flattened subimbricate scales, subequal to those on the snout; belly scales larger, imbricate. Tail cylindrical, tapering, covered with smooth imbricate scales, the dorsal ones considerably bigger than those on the body and the ventral ones likewise larger than those on the belly and much larger also than those on the dorsal surface of the tail. A row of four pre-anal pores: on each side of the base of the tail, three or four slightly projecting enlarged scales. Digital expansion moderate, considerably wider than the slender part.



- 1 *Oedura karroica* sp. nov. shewing scales of mental region
- 2 Ditto of *Oedura pondolia* sp. nov.
- 3 Ditto of *Phyllodactylus essexi* sp. nov.
- 4 Lower surface of third finger of left hand, *Phyllodactylus essexi* sp. nov.

Upper surfaces greyish brown marked on the back with about nine or ten irregular and undulating transverse dark lines: tail paler with indistinct dark cross lines dorsally: a dark stripe from the snout through the eye to a point above the ear: another

dark stripe from the ear-opening along the side of the neck to the shoulder: lower parts whitish.

Length from snout to vent 25 mm., tail (partly reproduced) 26, width of head 4.9, length of head 7.9.

Adult females taken more recently from the same locality are similar in the depressed head, but the rostral scale is more or less five-sided and a little deeper than in the male. There are five or six chin shields, the two middle ones scarcely larger than their fellows: in *lineatus* only two occur, these being much larger than the scales adjoining them. Mental shield at its apex much narrower than the first lower labial: in *lineatus* broader than the first lower labial. Either four or three upper labials in front of the orbit. Lower labials five or six. Large nasals separated by a single granule, or in one example by three small ones. In the posterodorsal portion of the orbit a single supraciliary scale is subconical and pointed: in *lineatus* from Tulbagh, two or three such scales occur. Colour markings are much as in the male, no specimens being found with the characteristic stripes of *lineatus*.

It would appear that a very constant point of difference between the two species is furnished by the shape of the mental scute.

Attention is called to the fact that the male of *essexii* differs from that of all other species of this wide-spread genus—so far as is known from the descriptions—in the possession of preanal pores. It differs from the familiar Cape species *porphyreus* in many respects—the presence of chin-shields, the notched rostral shield, and the extremity of each digit superiorly, immediately above the claws (but not above the lateral expansions), is covered with many scales which are smaller than those over the rest of the digit, whereas in *porphyreus* there are only several somewhat enlarged scales. Nevertheless, on the subdigital characters [Text fig. 4] the several Cape species seem to constitute a natural group, easily distinguished from those Australian species figured in the British Museum Catalogue, so that a revision of the species commonly referred to *Phyllodactylus* may result in generic

separation of this section. In the British Museum Catalogue of Lizards, *lineatus* is arranged alongside the Malagasy species *pictus*, but actually the two species are by no means closely related.

OEDURA PONDOLIA sp. nov. [Pl. XVI, fig. 2.]

Types: Three examples collected at Mbotyi River mouth, Lusikisiki, C.P., by Mr. W. Roberts, who presented them to the Albany Museum. They were found in a hut built under large pine trees.

The characters of *pondolia* are:—digits of hands and feet rather slender, each with only one pair of well-developed adhesive plates at the distal end of the basal portion inferiorly, and adjacent thereto is a single transversely enlarged scale which terminates the row of enlarged scales along the midline of each digit inferiorly: this median row of scales, which gradually increase in size towards the distal end of the row, varies in development, the middle toe generally having about six or seven scales, but sometimes only the four distal ones are differentiated from the adjacent scales: these scales with the exception of the two distal ones are subcircular, or not much broader than long.

Large nasal scales well separated by a scale, which is considerably larger than any of the scales adjoining the nasals, the two other nasals about equal to each other in size: rostral and first labial entering the nostril: rostral scarcely more than twice as broad as high: mental scute [Text fig. 2] large, considerably broader at the base than the first labial, narrowing rapidly and thus more or less subtriangular: scales immediately behind the mental and first labial very large, almost as long as a series of five small scales on the middle of the throat. Lower labials 8-10.

Dorsal scales granular and convex on the head and neck, subimbricate and somewhat flattened on the body, these latter being decidedly larger than the scales on the occiput. Male with a short oblique row of three or four small tubercles at the base of the tail on each side of the vent, the uppermost largest: 13-14 preanal pores.

Tail long, slender, and tapering, not depressed, and without

a trace of segmentation, except that the scales are all arranged in rings.

Colour pattern of spirit specimens: above greyish white with infuscated stripes and bands of somewhat variable type: a dark stripe on each side of the head from the nostril, through the eye, above the ear and alongside the neck for a short distance, passing into one or more of the irregular cross stripes on the back: there are about five such cross bands on the back and neck and one on the occiput, all with more or less irregular margins and tending to fuse up into a general reticulation. On the original tail also there are indications of dark cross bands, but the reproduced tail has no such cross bands, and instead there are spots and longitudinal stripes. Upper surface of head with indefinite infuscation: canthus rostralis pale.

Total length 100, tail (partly reproduced) 53, head length 13, breadth of head 9.5 mm.

The South African Museum has this species from Durban and Kentani. In the Kentani specimen the large nasals are separated by two moderate sized scales.

Also, quite recently, Mr. W. Roberts has kindly procured for me specimens from the Mqanduli district: these have 15 preanal pores, and the large nasals are separated by two scales.

The segmented character of the tail is common to all known South African forms other than *pondolia*. In a young specimen of *nivaria* from Majuba Nek, Herschel district, seven such segments are distinctly visible in the basal half of the tail.

The records of the previously described species from this region, *africana* and *nivaria*, have been considerably confused, owing to some uncertainty regarding their distinctive characters. Thus, from Durban both species have been recorded, but actually neither of these species occurs there, the form found in the coastlands of Natal being *pondolia*.

O. pondolia has hitherto been identified with *O. africana* Blgr., nearly all the examples recorded under that name by Mr. Boulenger in his report on the reptile collection of the South African Museum being actually referable to *pondolia*. I am

indebted to Dr. K. H. Barnard for an opportunity of examining these specimens, including the co-type of *africana*, which is said to have been found at Walfish Bay. From the latter example, it appears that some of the more important characters of *africana* are as follows:—digits of hands and feet each with two pairs of well-developed plates at the distal end of the basal portion inferiorly: fifteen preanal pores: large nasal scales in contact, forming a fairly long median suture: two other nasals, the upper one larger: rostral and first labial entering the nostril; mental scute small, at its base not broader than the first lower labial, narrowing somewhat towards the apex, but on the whole considerably resembling the first labial.

It is remarkable that *africana* has not been recorded again from any portion of South-West Africa; and, so far as I can ascertain, the various German explorers in that region have failed also to take specimens of the snake *Pythonodipsas carinata* from whose stomach the type specimens of *africana* were obtained. However, this species of snake does actually occur in Damara-land, for specimens were taken there by the Durban Light Infantry during the Great War at a locality between Otavi and Omaruru.

The Transvaal Museum has a single specimen from Clearwaters, near Haenertsburg, Zoutpansberg district, collected by Mr. G. van Dam, which seems at least worthy of varietal distinction, and is now described as

OEDURA PONDOLIA MULTIPORIS subsp. nov.

The distinguishing characters are:—17 preanal pores; large nasals separated by a scale which is smaller than the scale immediately posterior to each large nasal; mental five-sided, not narrowing so much from the base as in *pondolia*; dorsal scales rounded, hardly flattened, and not subimbricate; digits slender. The dark markings of the dorsal surface form an indefinite coarse reticulation.

Total length 112, breadth of head 11.5 mm.

OEDURA KARROICA sp. nov. [Text fig. 1.]

Type: A single specimen in the collection of the South

African Museum (No. 11,019), labelled Albany District (French). The Albany Museum has a much smaller specimen of the same species from Graaff-Reinet presented by Rev. John Whaits. The chief characters are as follows:—Head flattened, snout pointed. Large nasal scales in contact, forming a fairly long median suture: two other nasals, the upper one larger: first labial entering the nostril, but rostral shut off therefrom: mental and first two lower labials considerably elongated, the mental about as broad as the first lower labial at its base, but narrowing gradually towards its apex, so much so that in the apical half it is scarcely half the width of the labial, or even less than half—in the juvenile from Graaff-Reinet is not so much narrowed, but is narrower than the first labial: no definite chin-shields, the enlarged shields adjoining the mental and first labial merging quite gradually into the smaller scales of the throat: digits with two pairs of adhesive plates at the distal end of the basal portion inferiorly. All the scales on the head strongly flattened. Scales on the middle of the back larger than those on the occiput, but subequal to, or a little smaller than those on the snout.

The type specimen is devoid of tail and generally in poor condition, so that colour pattern and certain details of scaling are not ascertainable. The baby specimen from Graaff-Reinet has a series of about six irregular dark cross-bands on the back: the tail is short and shows indications of segmentation at the base, but the greater portion is scaleless, being reproduced. Scales on head depressed, but not so strongly as in the type. Inferomedian row of scales under each toe including only rounded scales except the distal one.

Judging by the size and arrangement of the scales in front of the vent, I presume that the male will prove to have six or seven preanal pores as in *transvaalica*. The type measures 43 mm. from snout to vent.

OEDURA AMATOLICA sp. nov. [Pl. XVI, fig. 3, and XVII, fig. 2.]

Types: Two adult males and one female, collected under large stones on the summit of the Amatola Range near Hogsback, C.P., by Miss O. Siggs and Mr. R. Essex (Sept., 1924).

This species has considerable resemblance to *pondolia* in the characters of the scutellation of snout and chin, but seems distinct therefrom in the digital characters: there are smaller differences in the number of preanal pores, and in the segmentation of the tail.

A stout heavy form. Large nasals separated from each other by an enlarged granule. Rostral and first labial entering the nostril. Rostral hardly twice as broad as high. Mental large, slightly broader than the first labial at its base, narrowing towards its apex, subpentagonal or subtriangular. Enlarged chin-shields present. Lower labials 7-9. Dorsal scales convexly granular on the head throughout, somewhat flattened and subimbricate on the back, smallest on the occiput. Digits of hands and feet rather stout, each with two pairs of well-developed adhesive plates at the distal end of the basal portion inferiorly: there is an inferomedian row of about six or seven enlarged scales, all of which are much elongated transversely, the distal one very greatly so, being dumb-bell shaped. Male with an oblique row of four tubercles at the base of the tail on each side of the vent, the uppermost largest: 12 preanal pores. Tail a little depressed, and showing distinct segmentation at the sides, but this is scarcely noticeable to the naked eye: reproduced portion without segmentation.

Above brownish grey with about seven or eight irregular wavy, darker cross-stripes on the back: loreal region dark, but no definite stripe. Total length 100, tail (partly reproduced) 46, breadth of head 11.5.

The South African Museum has a specimen of this form from Stutterheim, C.P., measuring 59 mm. from snout to vent.

OEDURA TRANSVAALICA sp. nov. [Pl. XVI, fig. 1, and XVII, fig. 1.]

This species is based on a series of nine specimens in the Transvaal Museum collected at N'jelele River, Zoutpansberg district, by Mr. G. P. F. van Dam (June, 1916).

It is a flat and rather slender form, distinguished from *africana* in that the large nasal scales, instead of meeting along

the whole of their length, form only a short suture, or even just fail to meet; in one case there is a long suture, but the specimen is certainly juvenile: in another case, there is imperfect contact at a single point. Rostral and first labial entering the nostril: in one instance, the first labial is almost shut off therefrom. Dorsal surfaces with more or less flattened granular scales: scales on snout not so flat and larger than those on the middle of the back: scales over the orbits large and much flattened, those on occiput smallest, those on the back not subimbricate. Rostral rather more than twice as broad as high; mental five-sided, much like the adjoining labials. No well differentiated chin-shields, the large shields immediately succeeding the mental and anterior labials being followed by scales which gradually and regularly diminish in size. Digits moderately stout, each with two pairs of adhesive plates at the distal end of the basal portion inferiorly: each toe (except the first) with an infero-median row of transversely elongated scales. Males (three specimens) with six preanal pores in a transverse row; also, on each side of the vent an oblique row of three small tubercles.

Females and young males, in which preanal pores are not yet developed, have six or seven enlarged scales in the same position as the enlarged scales which bear pores in the adult male: these scales are easily distinguished, being elongated longitudinally and much larger than the scales immediately preceding and succeeding them.

Tail depressed, much narrower than the body at its base; long, slender, and tapering gradually, distinctly segmented throughout the basal half at least, and faintly so in the distal portion: this segmentation is noticeable ventrally as well as laterally and dorsally, and in one specimen about 20 segments are present.

Pale greyish above, with irregular and incomplete dark cross-markings, which on the back tend to form median blotches; about five on the back and neck, about seven on the tail and a narrow one across the occiput.

Total length 122, tail 64, breadth of head 12 mm.

I have examined specimens from Southern Rhodesia which clearly belong to this species.

There is a large specimen from Umtali in the South African Museum. It differs slightly from the types in that all the head scales, including those on the snout, are much flattened and there is only one pair of adhesive plates at the end of the basal portion of each digit inferiorly. Also, the head is still more depressed, canthus rostralis obsolete, rostral more than twice as broad as high. Mental five-sided, and decidedly smaller than the first labial, no chin-shields. Upper surfaces blotchy, the pale bands more or less broken up into white spots. Total length 119, breadth of head 12.75.

The Rhodesian Museum has two specimens from the Matopos which also differ from the type of *transvaalica* in the more flattened head [Pl. XVI, fig 4] and the smaller mental shield: this latter is markedly smaller than the first labial. Snout a trifle more pointed than in the types. Second pair of adhesive plates on basal portion of digit very ill developed or lacking. Dorsally there are in spirit specimens, strongly contrasted dark and light markings as alternating cross-bands which in one specimen tend to break up into spots or blotches. Total length 117, snout to vent 61, breadth of head 12.4 mm. This variety I now name *O. transvaalica* sub-sp. *platyceps*, the type being from Umtali; and the most easily ascertained point of distinction being the form and size of the mental shield which even at the base is narrower than the first labial.

The strongly depressed head and body suggests a confirmed rupicolous habit: it is interesting to note that a very similar modification is found in the rock-dwelling scorpions of the genus *Hadogenes*.

Lastly, in the collection of the South African Museum there is a small specimen from Inhambane, P.E. Africa, which though related to *transvaalica* is probably distinct. The large nasal scales are quite separated by a fairly large scale: all the scales on the snout are large and very much flattened, being scarcely

distinguishable from the smaller nasals in size. Owing to its juvenile condition, I refrain from attempting to define the species.

The various forms now known from South Africa can be distinguished as follows:—

1. Head scales granular: chin-shields present.
 - A. Rostral separated from the nostril. *nivaria* Blgr.
 - B. Rostral entering the nostril. Toes slender. Large nasals separated by a large scale (or by two scales of moderate size). *pondolia* sp. nov.
 - C. Like B, but large nasals separated by a single small scale. sub-sp. *multiopris*.
 - D. Like B, but toes stout, each with an inferomedian row of transversed elongated scales. *amatolica* sp. nov.
2. Head scales flattened: chin-shields not well differentiated.
 - A¹. Large nasals in contact throughout their length: rostral and first labial entering nostril. Fifteen preanal pores. *africana* Blgr.
 - B¹. Large nasals in short contact. Six preanal pores. *transvaalica* sp. nov.
 - B². Like *transvaalica*, but mental decidedly smaller than first labial instead of subequal thereto. *transvaalica platyceps* sub-sp. nov.
 - C¹. Large nasals well separated by a scale. *species from Inhambane*.
 - D¹. Large nasals in long contact: rostral not entering nostril; (preanal pores probably six). *karroica* sp. nov.

Family SCINCIDAE.

SCELOTES BREVIPES sp. nov. [Pl. XV, fig. 4.]

This species is founded on a series of examples collected at Lourenco Marques, P.E.A., by Mr. G. van Dam, the types being in the Transvaal Museum. Hitherto, the species has been variously identified with *guentheri* Blgr., or *inornatus* Smith, for there is some uncertainty connected with the characters of these

latter. The outstanding facts are as follows:—*guentheri* is only known from the type specimen in the British Museum, and is supposed to have come from Natal: *inornatus*, recorded by Smith from "arid situations in the interior of Southern Africa" and described at length in the appendix (p. 12) of his great work on the Reptilia of Southern Africa, may or may not be the same as the form described and figured under that name by Boulenger in the British Museum Catalogue of Lizards (Vol. III, p. 415). I make this remark in spite of the fact that a specimen in the British Museum is claimed to be the "type" specimen, for Smith's description of the frontal scute and of the supraoculars does not tally well with Mr. Boulenger's figure and description.

The form now described nevertheless differs from the *inornatus* of both authors in possessing well defined rudiments of the hind limb. The Transvaal Museum has a large series from Lourenco Marques in all of which that rudiment is present according to Mr. van Dam. It is present also in the several specimens of this species from Umfolosi, Zululand, which were recorded by Boulenger as *guentheri* in Annals Natal Museum, Vol. I, p. 226, and more recently identified by him (in lit.) as *inornatus*.

The other characters of *brevipes* are:—Snout obtuse, not projecting beyond the labial margin, lower eyelid scaly, ear-opening just distinguishable, supranasals forming a median suture and in contact with the first labial: fronto-nasal imperfectly six-sided: frontal bell-shaped, not quite twice as long as the frontonasal: four supraoculars, the hindermost smallest, five supraciliaries followed by a larger scale of different shape (supraciliaries four and five occasionally fused together), interparietal slightly shorter than the frontal: parietals narrow, bandlike, meeting behind, and adjacent thereto on each side a pair of elongated temporals, the inner pair meeting behind: fourth upper labial which is below the eye, as long as the second and third together, or nearly so: 18 scales round the middle of the body. A clawless rudiment of the hind-limb, measuring 1 mm. in length or a little less. Tail about equal in length to head and body combined, sometimes a trifle longer. Dorsally the body is light brown, each scale with a darker spot, thus forming

four longitudinal dark stripes or rows of spots: laterally much more strongly infuscated: ventrally pale, but all the scales with darker centres, chin and throat not or scarcely infuscated. On the tail there is no differentiation of dorsal and lateral surfaces, a general infuscation prevailing.

Tail 60 mm. Head and body 62 mm.

The specimen from Kosi Bay, Zululand, identified by Boulenger (loc. cit.) as *inornatus*, has much resemblance to those now described, and is perhaps specifically identical therewith. Nevertheless, the Kosi Bay lizard has not even a trace of the hind-limb visible externally and is thus in better agreement with Smith's *inornatus*: it seems to differ from the latter in the colour of the ventral surface, and in the supraoculars, which Smith described as "five in a row, and a small one below the last, all square."

The Kosi Bay specimen is also noteworthy in possessing additional scales on the head: there is a minute one on each side between the fourth supraciliary and a second supraocular: there is also a pair of small frontoparietals. Frontal slightly more than twice the length of the frontonasal, the latter being shorter than in *brevipes*. Thus, the specific identity must remain doubtful until more material from the same locality is available.

The species now described can be recognised from its known allies as follows:—

1. A small but distinct post-nasal (or nasal) scale between supranasal and first labial: four supraoculars: temporals not elongated: a minute bud-like rudiment of hind-limb: palatines in contact. (Port Natal.) *guentheri* Blgr.
2. A minute post-nasal; three supraoculars, the first largest: frontal subpentagonal but rounded behind: palatines separated: no visible hind-limb. (Mosambique and Zululand.) *arenicola* Ptrs.
3. A minute post-nasal: four supraoculars, parietals in contact or separated: palatines separated: no visible

hind-limb. (Port Elizabeth to Peddie district.) *anguina* Blgr.

4. Resembling *anguina*, but palatines in contact for a short distance only. (Durban.) *natalensis* Hwtt.
5. Post-nasal obsolete, only a faint trace recognisable: four supraoculars, temporals elongated: palatines in contact for a considerable distance: hind-limb rudiment visible (? sometimes absent). *brevipes* sp. nov.

Species incertae sedis.

- A. A minute post-nasal: four palpebral plates, and a small one under the last: frontal somewhat five-sided, but rounded behind, a long narrow transverse plate behind each parietal: palatal slit long, bifid anteriorly. Limbs absent. (Little Namaqualand.) *bicolor* Smith.
- B. Apparently no post-nasal: frontal somewhat bell-shaped: palpebral plates five in a row and a small one below the last, all square: limbs and palatal slit as in *bicolor*: under parts wine yellow. (Loc. ?.) *inornatus* Smith.

Family LACERTIDAE.

BASUTOSAURA gen. nov.

Resembling *Tropidosaura* except in the characters of the nostril and dorsal scales: differs also from *Psammodromus* in the dorsal scaling, and apparently in the shape of the head. Genotype *B. cottrelli* sp. nov.

In the following description, comparison has been made with *Tropidosaura montana*, which is presumed to be the nearest known ally of this new form.

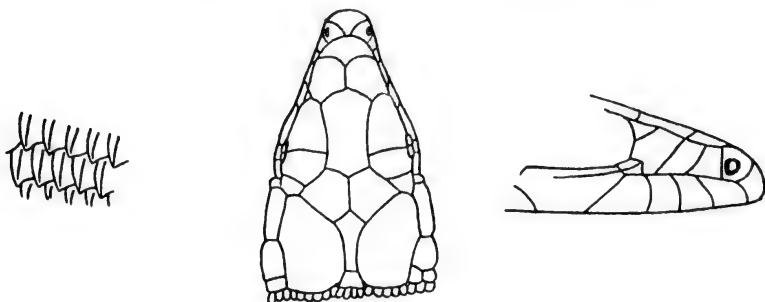
B. COTTRELLI sp. nov. [Text fig. . .]

Type, a single specimen collected at the Nemahadi Police Camp near Mont aux Sources in Basutoland, at an elevation of 10,600 feet, by Mr. J. A. Cottrell during January, 1925. At the same locality, other reptiles collected were:—*Eremias burchelli*, *Pseudocordylus microlepidotus* and *Trimerorhinus rhombeatus*.

Snout rather elongated. Head, including occiput, flattened

above: canthus rostralis rounded: loreal region very slightly concave: a fairly sharp keel below the eye on the frenoocular and subocular shields. Nostril in the inferoposterior portion of a single nasal which is separated from its fellow owing to the meeting of the rostral and frontonasal. Only a very narrow rim separates the nostril from the postnasal, but the former is more widely separated from the lower labial. Postnasal as broad as the anterior loreal, well separated from the rostral, but in contact below with both first and second labials and above with the frontonasal. Suture between nasal and postnasal is well posterior to that between rostral and first labial which latter suture lies just below the anterior border of the nostril. Frontal as long as its distance from the end of the snout. Interparietal shield narrowing considerably behind (more so than in *montana*), its hinder half raised into a slight median ridge. A small occipital shield in contact with the interparietal and its hind border in a line with that of the parietals. Between the supraoculars and supraciliaries just above the posterior portion of the eye is a pair of elongated granules. First supraocular separated from the posterior loreal by an elongated granule on the left side: on the other side there is no such granule, the prefrontal alone intervening between loreal and supraocular. The three large supraoculars more or less as in *montana* but the second is distinctly broader than long. Third supraocular in good contact with the frontoparietal. Second supraciliary much longer than the others. An enlarged tympanic scale on the superoanterior border of the ear opening: this is the hindermost of a row of six enlarged scales in the temporal region. Between this row and the two enlarged supratemporals on each side are two rows of smaller scales: and below that row also are one or two rows of smaller scales. All the scales on the head and temporal region are smooth: the parietals and frontoparietals however are very faintly corrugate. Pineal spot inconspicuous. The head scales are followed on the neck by four or five transverse rows of small simple scales: these pass into the fairly large rhombic keeled and imbricating scales which extend over the remainder of the dorsal surfaces: the apex of each scale is acute, but the keel

is not continued to a sharp point as in *montana*. At the middle of the body a transverse row has about 22 such keeled scales. Laterally these keeled scales pass into smooth lateral scales of which there are about four rows: these scales increase a little in size as they approach the ventrals. Sides of neck with small subgranular scales. Three anterior pairs of chin-shields in contact: gular scales rather small but imbricate, not granular. There is a transverse row of still smaller scales across the throat between the ears: this gular fold would be scarcely noticeable but that it forms a blackish cross-streak. From this row up to the chin-shields about eight scales can be counted along the midline: and from the same row up to the large breast scales about ten scales occur along the midline. Behind this row, the numerous



Basutosaura cottrelli sp. nov., shewing dorsal scaling,
upper surface of head, and side view of snout

scales of the throat gradually increase in size and merge into those of the breast. The breast scales are more or less subequal in size, but the ventral scales of the body are in six longitudinal rows of which the innermost and outermost pairs are composed of scales not much broader than long, whilst the remaining pair is of scales quite twice as broad as long. Of these broadest ventral scales about 21 occur in each row. A large median pre-anal plate bordered in front by a semicircle of six scales of which the two middle ones are by far the largest. Eleven femoral pores on each side. The adpressed hind-limb not quite reaching

the axilla. Digits slightly compressed laterally, with smooth lamellae inferiorly: some of these lamellae are faintly furrowed, but there are no keels. Scales on upper surface of thigh smooth, of tibia rather weakly keeled. Greater portion of tail wanting in the specimen.

Colour: very dark almost black above with numerous small spots, some light brown, others pale green or pale blue: these occur on head, body and limbs without definite arrangement but tending to form incomplete cross stripes posteriorly. Sides of body pale blue divided by a longitudinal blackish streak which continues along the neck to the margin of the upper lip. Ventral surfaces pale blue profusely spotted with black, the black predominating on the belly.

Measurements: Head and body 66 mm., length of head to hind border of occipital scale 15, breadth of head 11, depth from occiput to throat 6.9, from end of snout to fore-limb 25, length of fore-limb 23, of hind-limb 34, of fifth toe (claw included) 7, of fourth toe 12.2, of third toe 7.5.

Although this is well separated from any other known species, I have proposed the new generic name with some hesitation. The nasal character on which Boulenger relied in discriminating genera of this family is not really so very constant. Mr. K. P. Schmidt has commented on its variation in the genus *Algiroides* (see "Herpetology of the Belgian Congo" in Bull. Am. Mus. Nat. Hist. XXXIX, p. 501, 1919). There is said to be some variation in this character in *montana*, but the descriptions of *burchelli*—a synonym of *montana* according to Boulenger—seem to indicate a condition quite different from that now described. I may add that all specimens of *montana* in our collection have two post-nasal scales.

In the nasal character, *Basutosaura* seems more akin to the Mediterranean genus *Psammodromus*, and it may be that this is an expression of real affinity: certainly there are cases of real affinity between S. African and Mediterranean forms in other groups of animals (cf. *Opisthophthalmus* and *Scorpio* in the order Scorpiones). But, there are various points of difference

Amatolica has no direct relationship with the other small species described from South Africa, viz., *vertebralis* Smith and *fenoulheti* Hewitt and Methuen, being distinguished therefrom especially by the shape of the snout and the well developed parotoids: in *vertebralis* the snout is vertically truncate at the end, and in *fenoulheti* it is rather strongly projecting.

As a distribution record, this seems a noteworthy instance of connection between the faunas of the Amatola region and of the S.W. Cape. The lizards of this locality also show close relationships with south-western species: *Tetradactylus laevicauda* mihi, known from Hogsback and Tabamhlope, Natal, has its nearest ally in the south-western *T. seps*, and the Hogsback neighbourhood is the most eastern record known for the Cape species *Tropidosaura montana*.

BUFO VERTEBRALIS Smith. This species is known to me from the following localities:—Bloemfontein, Kimberley, Victoria West, Aliwal North, and Halesowen near Cradock. The series presents only minor points of difference: that from Halesowen has the tympanum small and indistinct and the divided parotoid gland more prominent than in specimens from other localities.

There is also a series of small toads in the collection of the Transvaal Museum from Bleskop, Rustenburg district (Mr. G. van Dam) which are related thereto, but differ as follows:—ventral surfaces quite without dark markings; the finely granular asperities of the dorsal surface extending entirely over body and head as far as the tip of the snout (snout and fore part of head quite smooth in *vertebralis*): parotoid glands depressed but fairly well defined, not divided into two, extending back a considerable distance and occupying a rather large area (in *vertebralis* more or less distinctly divided into two with the hinder portion often very ill developed): all the larger tubercles under the fourth toe are paired and the tubercles at the bases of one or more of the fingers are also paired. In the female, the upper lip and loreal region is faintly granulated, but in the male strongly so. Length from snout to vent, male 25, female 29 mm. According to Boulenger, *vertebralis* is closely related to the

Angola species *dombensis* Boc. I have examined specimens of this species in the British Museum collection and am satisfied that the Rustenburg specimens are quite distinct therefrom, *dombensis* having the upper surfaces much smoother: the latter is moreover much larger, Bocage's measurement of the total length being 38 mm. male, and 41 mm. female.

The relationships of the Rustenburg series are with *B. fenoulheti* Hewitt and Methuen, a species hitherto only known from the type specimens collected at Newington and in the Woodbush: the chief difference, apart from size, lies in the fact that the snout is more distinctly projecting and pointed in *fenoulheti* from Newington, and is more or less truncate in the Rustenburg specimens. Thus, the position of the nostril in the latter is much nearer to the end of the snout than to the supraciliary thickening, but midway in *fenoulheti*, or even a trifle nearer to the supraciliary. Also, the interorbital space is narrower than the upper eyelid in *fenoulheti*, a little broader than the eyelid in the Rustenburg specimens. To these specimens from Bleskop I now apply the name *BUFO FENOULHETI* sub-sp. *OBTUSUM*.

HELEOPHRYNE ROSEI sp. nov. [Pls. XVIII and XIX.]

This species is founded on adult male and female examples and full grown tadpoles collected on Table Mountain by Mr. Walter Rose.

Head broad and depressed, snout obtuse and rounded, canthus rostralis distinct from nostril to eye, occiput, interorbital space and top of snout flat, the sides of head sloping gently therefrom, loreal region concave, nostril rather prominent, much nearer to the end of the snout than to the anterior corner of the eyelid, eye large and prominent, length of upper eyelid subequal to or very slightly exceeding the distance of its anterior corner from the nostril. A conspicuous swelling behind the eye on each side of the head: this, which presumably corresponds with the parotoid gland of *Bufo*, is sharply defined only on its outer side. Parotoid of male with a posterior extension nearly reaching the base of the fore-limb: in female terminating just behind the

tympanum. Tympanum rather indistinct, much smaller than the eye. Interorbital space broader than the upper eyelid.

Fingers free, terminating in triangular discs. Fourth finger extending considerably beyond the second, and the latter beyond the first. At the base of the first finger, the hand is extended laterally by the rudimentary pollex: this is very marked in dorsal view of the hand, and ventrally forms an elongated tubercular swelling. Male with a strong swelling at base of first finger on inner side, but this has no horny or granular excrescences. At the base of each finger a well marked subarticular tubercle: other subarticular tubercles are not well developed, but a single one is present on both third and fourth fingers. A flat rounded palmar tubercle.

Feet well webbed, the web extending to the bases of the terminal discs excepting on the fourth toe. Metatarsals all separated by web distally. A small inner metatarsal tubercle. A subarticular tubercle occurs at the base of each toe, also two under IV, and one under III and V. Tibio-tarsal joint of adpressed hind-limb reaching as far as the anterior angle of the orbit in female, almost to the nostril in male.

Body of female with dorsal and ventral surfaces quite smooth. Sides of body from the head to the inguinal region with minute isolated asperities scarcely noticeable to the naked eye, each small white spot having a corneous granule in the centre: upper lip with a few such granules near the angle of the mouth: there are also a few on the thigh posterodorsally. In the male these asperities are much more conspicuous. They extend over the middle of the back in its posterior half, and on the sides of the body they take the form of numerous small granular warts: ventrally there is a Λ -shaped patch bearing minute scattered granules immediately in front of the shoulder girdle, and a granulated patch occurs on each side of the body ventrally in the inguinal region. A few scattered granules occur also over the thigh and leg. Along the margin of the upper lip a very fine granulation extends throughout: this becomes strongly developed above the angle of the mouth.

Vomerine teeth in two separate groups; choanae large and

conspicuous, well removed from the margins of the mouth cavity. Openings of Eustachian tubes distinct but considerably smaller than the choanae.

Fore-limbs of male fairly stout, the humerus with a strong preaxial crest but no other well marked crest.

The sternum is typically arciferous, the right side overlapping the left. Metasternum a large, simple, oblong plate about three times as long as broad, and quite separate from the rest of the apparatus: it is bony in front, thin and cartilaginous behind, tapering a little posteriorly. A rounded cartilaginous omosternum: this, though very thin, is quite well marked, as is also the case in *regis mihi* (my original description being incorrect in this respect).

Colouration (spirit specimens): upper surfaces chocolate red with an indefinite grey reticulation: the grey occurs as numerous small spots on the sides of the body: on the fore part of the head, the grey colour predominates. Limbs banded: three or four bands across the leg, three across the tarsus, and bands also occur across the outer toes. Lower surfaces whitish.

Length from snout to vent, female 63 mm., male 41; breadth at gape, female 22.5, male 16; breadth of disc on third finger of female 4.5, male 3.

The type female is distended with eggs which are large and yellow.

This species is probably closely related to *natalensis mihi* (Annals Natal Museum II, p. 475-484, 1913), a species founded on a very young specimen taken at Krantz Kloof, Natal. I do not doubt but that the two will prove to be well distinct, although the adult of the Natal species is still unknown. It is distinct from *purcelli* Sclat. and *regis mihi* in the smoothness of the belly: these two species are evidently nearly related to each other but can be at once distinguished on the webbing of the feet.

TADPOLE. The tadpole resembles that of *natalensis* in general characters, but differs as follows:—the sucking disc is oval in outline, rather than subcircular: three upper rows of labial teeth are well developed, instead of two: fifteen lower rows of

teeth: horny beak obsolete, no trace of black or infuscated chitin being found, whereas *natalensis* has a black lower beak. In dorsal view it is broad and almost truncate anteriorly, rather than well rounded as in *natalensis*. Tail and its membrane terminating rather suddenly, not tapering gradually. The oral aperture seems to be permanently opened wide in *natalensis*, but in *rosei* is closed in spirit specimens.

Total length 53 mm., breadth of disc 11 mm.

Other measurements taken by Mr. Rose are as follows:—length of tadpole 47 mm., of head and body of a four-legged tadpole $19\frac{1}{2}$, of head of same 10, width of head $9\frac{1}{2}$, length of a froglet 17: the froglet is shorter than combined head and body of the tadpole owing to the smaller head.

As I am informed by Mr. Rose, this species is essentially aquatic in habit and is never arboreal. All the specimens he could find were in running mountain streams, generally under stones: captive specimens in his vivarium preferred to remain indefinitely in water and showed no interest in climbing. Apparently *H. rosei* is confined to the Cape Peninsula whilst *H. purcelli* occurs in the neighbouring hinterland at Wellington and French-hoek. The latter species is reported to be more typically frog-like than *rosei* which sits very flat. It may be noted that when mating the female is grasped round the hips.

I take this opportunity of recording the genus *Heleophryne* from the Woodbush, Transvaal, where it was found a year or two ago by Messrs. Wager and van Dam. One specimen of the frog was found "in the hollow of a bank in the bush": the tadpoles were common in the rocky streams, clinging to the rocks under water.

The relationships of this peculiar genus are still obscure. I have recently ascertained that *Heleophryne* has only seven pre-sacral vertebrae: the first vertebra is a large one and bears well developed diaphophyses. Such being the case, it is even doubtful if the genus should be referred to the *Cystignathidae*—which as Dr. E. K. Noble has shown cannot be sharply separated from the *Bufo*nidae. Nevertheless, several characters of *H. rosei*

are very suggestive of Bufonid relationship: such are the parotoid glands and the skin asperities. For the present therefore I regard it as an aberrant genus of the Bufonidae. Some material has been submitted to Miss Joan Procter for anatomical investigation and it is hoped that her researches may solve this problem. In the meantime, it may be noted that according to Annandale and Hora (Records Indian Museum, Vol. XXIV, p. 506, 1922) the tadpole of *Heleophryne* closely resembles an unidentified larva from the Malabar zone of India. They say: "the structural analogy is so close that it does not seem too much to claim that there is also a homology, in other words that a genetic affinity exists." Yet, no frog of the family Cystignathidae is known from the Oriental region.

Family BREVICIPITIDAE.

CACOSTERNUM CAPENSE sp. nov. [Pl. XV, figs. 1 and 5.]

Types, two examples collected by Mr. Walter Rose on the Cape Flats near Capetown, an adult male and a juvenile.

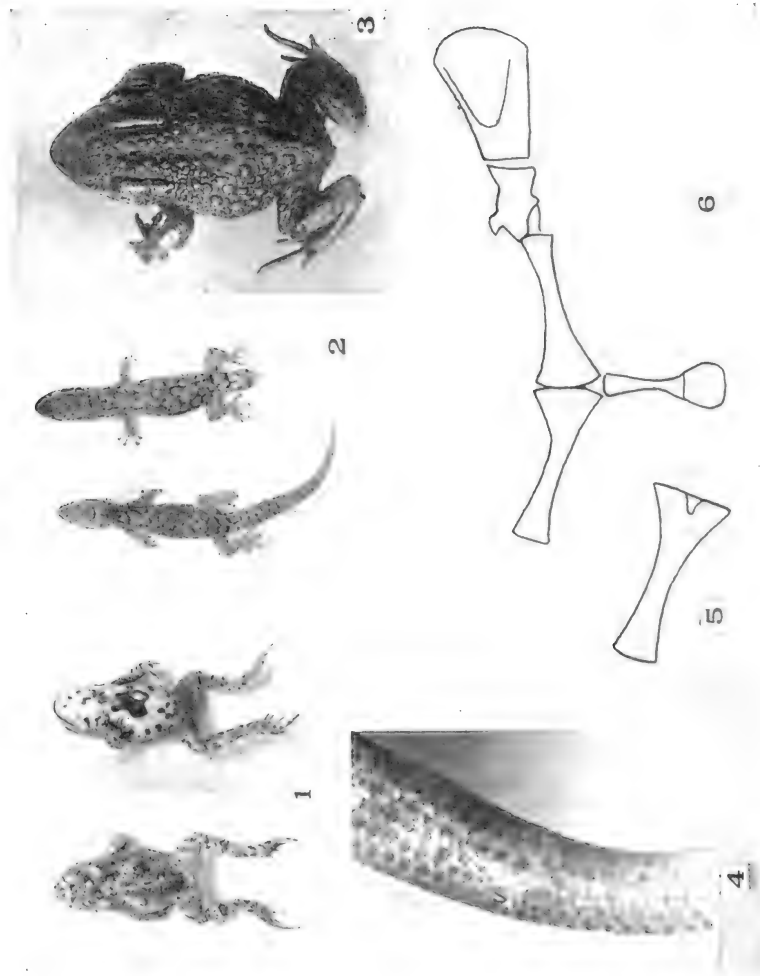
Habit rather short and stout. Head broad, snout short, rounded, and not projecting. Canthus rostralis indistinct, loreal region slightly concave. Eye rather large, its diameter greater than the distance between nostril and anterior angle of orbit. Interorbital breadth exceeding the breadth of the upper eyelid, or subequal thereto in young. Tympanum hidden. Tongue rather small, nicked behind but not deeply. Skin of dorsal surfaces smooth, without any folds: no fold behind the eye towards the fore-limb. Fingers and toes without web, bluntly pointed at the tips. Outer metatarsals united. Subarticular tubercles all weak: a small one at the base of each toe, also one under toe III, two under IV, and a very small one under V: fingers with a tubercle at the base of each, but no others except one under the longest. A large and prominent inner metatarsal tubercle, but no trace of an outer metatarsal tubercle. On the palmar surface, opposite to the bases of the fingers, are four very small warts, much smaller than the subdigital tubercles. Two palmar tubercles, neither of them prominent, and one of them very indistinct.

Skin of post-ventral region of thighs somewhat rugose but not definitely granular.

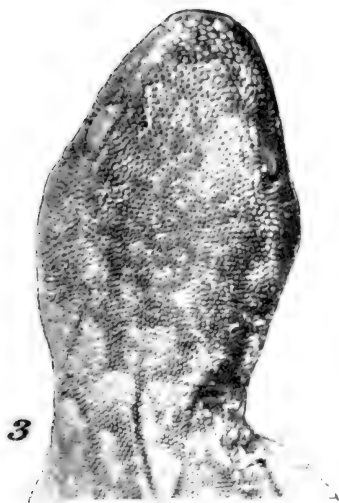
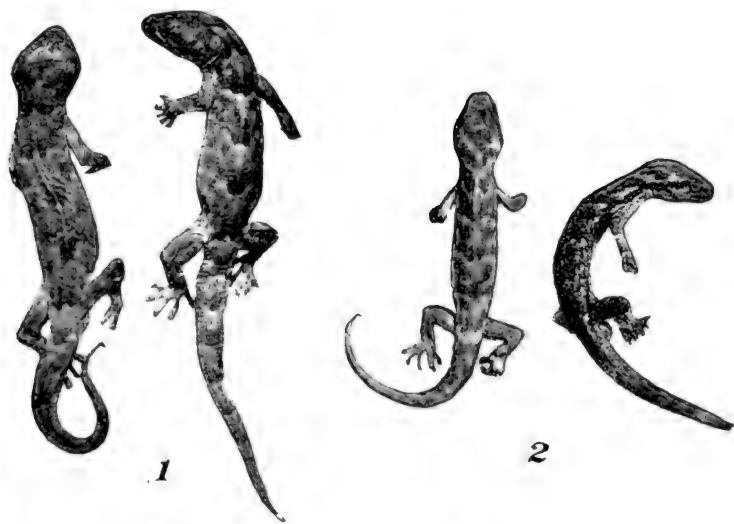
Limbs short, tibio-tarsal joint of adpressed hind limb falling far short of the tympanic region even in the male, and not quite reaching the angle of the jaw: in the young specimen the metatarsal tubercle reaches up to the angle of the jaw. Coracoid rather long but strong and with greatly expanded ventral end, which is ossified from two centres and thus has a double head with a cartilaginous vacuity in the middle. Sternum feebly ossified, slender, a trifle shorter than the ventral symphysis of the coracoids. Maxillary and premaxillary teeth well developed. No vomerine teeth. Skull with the two frontoparietals widely separated. Colour: upper surfaces ashy grey finely freckled with small dark spots and with a number of conspicuous ocelli which are pale in the centre and incompletely black-edged. Thighs not definitely banded: two more or less distinct dark bands across the leg. Lower surfaces creamy white with conspicuous irregular black spots and blotches.

Total length from snout to vent 26 mm., length of hind limb 34 mm., breadth of head at gape 10 mm.

This species is larger than the widely distributed *C. boettgeri* Blgr. and differs therefrom in the following respects:—the much stronger metatarsal tubercle, the ill-developed subarticular tubercles, the absence of a characteristic fold passing from the eye to the fore-limb, and the more obtuse snout. In some specimens of *boettgeri* there can be recognised distinct parotoids bounded externally by the above mentioned fold behind the eye: no trace of these is found in the two examples now described.

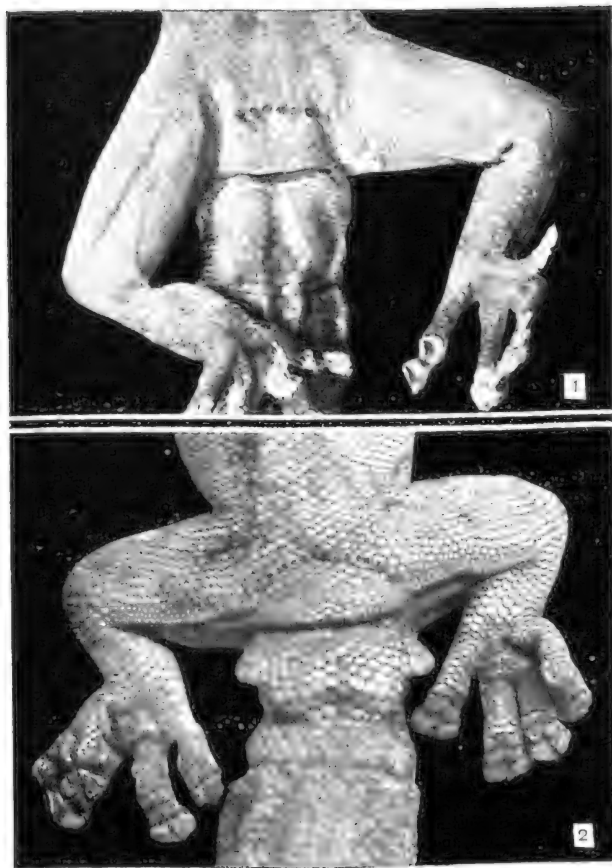


- 1 and 5. *Cacosternum capense* sp. nov. 2. *Phyllodactylus essexi* sp. nov.
 3. *Bufo angusticeps amatolica* sub-sp. nov. 4. *Scelotes brevipes* sp. nov.
 6. *Cacosternum boettgeri* Blgr.



1. *Oedura transvaalica* sp. nov.
3. *O. amalolica* sp. nov.

2. *O. pondolia* sp. nov.
4. *O. transvaalica platyceps* sub-sp. nov.



1. *Oedura transvaalica* sp. nov.

2. *Oedura amatolica* sp. nov.



Helicophryne rosei sp. nov.



Helicophryne rosci sp. nov.



EXPLANATION OF PLATES.

- Pl. XV. Fig. 1. *Cacosternum capense* sp. nov., dorsal and ventral views of smaller specimen.
Fig. 2. *Phyllodactylus essexi* sp. nov.
Fig. 3. *Bufo angusticeps amatolica* subsp. nov.
Fig. 4. *Scelotes brevipes* sp. nov. Ventral view of anal region, enlarged.
Fig. 5. *Cacosternum capense* sp. nov. coracoid.
Fig. 6. *Cacosternum boettgeri* Blgr. Pectoral girdle.
- Pl. XVI. Fig. 1. *Oedura transvaalica* sp. nov.
Fig. 2. *Oedura pondolia* sp. nov.
Fig. 3. *Oedura amatolica* sp. nov., showing head scaling, enlarged.
Fig. 4. *Oedura transvaalica platyceps* subsp. nov., from Matoppos, head scaling, enlarged.
- Pl. XVII. Fig. 1. *Oedura transvaalica* sp. nov., part of ventral surface, enlarged.
Fig. 2. *Oedura amatolica* sp. nov.
- Pl. XVIII. Fig. 1. *Heleophryne rosei* sp. nov., female.
Fig. 2. X-ray of same by W. Rose.
- Pl. XIX. Fig. 1. *Heleophryne rosei* sp. nov., ventral view of living female.
Fig. 2. Tadpole of same. (Photos by W. Rose.)



**Further descriptions of Reptiles and Batrachians
from South Africa**

BY JOHN HEWITT.

[Plates XX—XXIV.]

ORDER CHELONIA.

PELUSIOS SINUATUS SMITH.

In his important account of the "Herpetology of the Belgian Congo," Schmidt (1) alludes to the difficulty in distinguishing this species from *nigricans*, and, following Nieden (2), seems to think it may have to enter the synonymy of that species. However, after examining a series of twenty specimens I do not hesitate to accept Siebenrock's (3) conclusion that they are distinct species.

There appear to be several forms or subspecies of *sinuatus*. The typical form described by Smith (4), and apparently taken in the Kalahari region, is only known to me from Smith's account. It differs from that about to be described below in the second the third vertebral plates which are nearly horizontal, in the less pronounced vertebral protuberances, and in the curvature of the sides of the carapace, the shell being convex: also, the fourth costal seems to be rather larger, judging from the original figures, and probably the margins of the shell between the limbs are less salient, the outline of the shell being somewhat ovoid.

A second form now termed *Pelusios sinuatus zuluensis* subsp. nov. is based on a series of specimens in the National Museum, Bloemfontein, collected by Dr. van Hoepen near the Umsinene River, Zululand, August, 1922. (Pl. XX, fig. 1-3 and Text fig. 1.d.) 'At that time, the river was drying out and the water was undrinkable, being salt and bitter. The biggest speci-

(1) Bulletin American Museum Nat. History, XXXIX, p. 411.

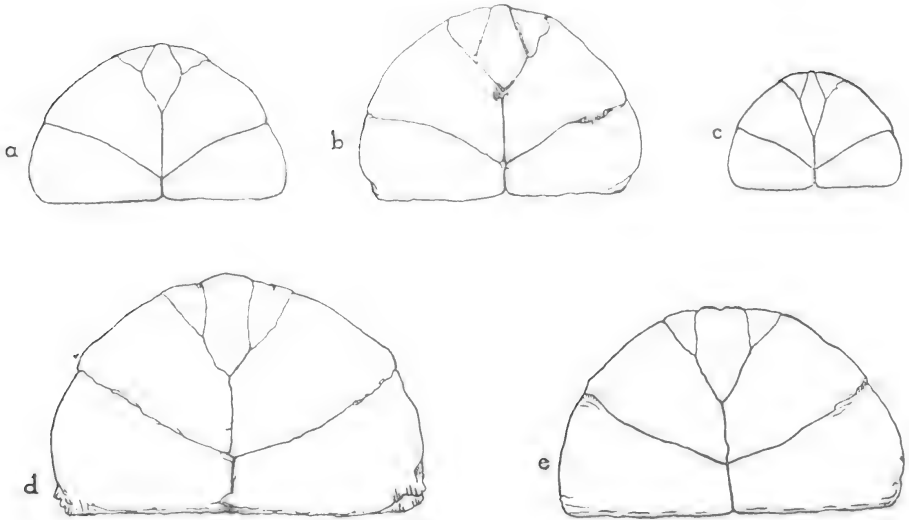
(2) Mit. a.d. Zool. Mus. Berlin, 7, I, 1913, p. 55-64.

(3) Zool. Jahrb. (suppl. 10), 1909, p. 556.

(4) Illust. Zool. S. Africa, 1849, Pl. I.

men was found about a mile east of the Umsinene Drift on the north side of the river where it was walking about the flat country between the river and adjacent hills. Other specimens were found under leaves in the bush on the north bank of the river about a mile to the east of the Munyana mouth. They were so far hidden that only the tops of their backs or hinder ends was visible.' [Dr. E. C. van Hoepen in lit.]

The following seem to afford important distinguishing characters of *zuluensis*:—shell well raised, sides obliquely sloping, not or scarcely rounded: third and fourth vertebrals with conspicuous median protuberances, that of the fourth larger, and second vertebral always with some indication of a protuberance: vertebrals II-IV generally longer than broad, sometimes pronouncedly so, but sometimes (half-grown examples) only III is longer than broad, or even scarcely so, whilst IV is about as broad as long, and II is a trifle broader than long: outer border of pectorals longer than that of humerals, a character which holds good at all stages apparently: gular shields rather long and large, inter-gular always elongated, about twice as long as broad, broadest in front, more or less spear-head shaped, its posterior angle rather more than 45° ; margin of shell between fore- and hind-legs obtusely angular, the costal shields being well developed ventrally, the ventral breadth of costal V being about equal to its length: costal VIII in contact with abdominal shield: elsewhere, the shell margin is sharp, sinuous or subdentate behind and the two penultimate costals on each side somewhat upturned: axillary shield well developed: anal shields with the apices distinctly curved towards each other, both free margins being curved, the outer one convexly, the inner one concave, and the transverse breadth of each shield is subequal to the length, in larger specimens exceeding the length. On the foot, claws II and III are long and strong, IV almost equal thereto, I a trifle weaker and V is smallest but still strong and functional. The length of longitudinal suture between the two shields on the snout is decidedly greater than the interorbital width in the largest specimen but distinctly less than the interorbital width in a half-grown specimen. Snout rather obtuse.



Text figure 1.

Anterior hinge of plastron in

- a. *Pelusios nigricans rhodesianus* subsp. nov. from Mpika dist.;
- c. Young specimen of same;
- b. *Pelusios nigricans* var. from Mashonaland;
- d. *Pelusios sinuatus zuluensis* subsp. nov. from Umsinene Riv.;
- e. Var. of same from Mpika dist.

Beak with shallow median notch and slight obtuse cusp on each side.

The upper surface of the head throughout finely and closely vermiculated with long yellow and brown lines. Plastron mostly pale, but dark brown or blackish at the periphery.

Measurements of type specimen: length of shell 330, breadth of shell 232, height of shell 137, length of third vertebral 66, breadth 56: length of fourth vertebral 64, breadth 53.

An isolated skull measures 68 mm. in length mesially, and breadth 57. This skull differs greatly from that of *niger* as figured by Gray (Brit. Mus., Cat. Chelonians, p. 192), the snout of *zuluensis* being much shorter and broader. The prefrontals are short, in front terminating well behind the front border of

the premaxillae. Lower edge of the upper jaw sinuated near junction of maxilla and premaxilla but with no prominent process or hook there. Supraoccipital not extending back so far as the opisthotic. Tympanic opening large, its rim ventrally (formed by the quadrate) being much reduced: "Zygomatic" arch weak, the quadrato-jugal being not nearly so deep as in *niger*, its contact with the jugal being greater than with the post-frontal: least depth of quadratojugal (measured obliquely) 7 mm. Tympanic ring in one specimen slightly interrupted postero-inferiorly.

The Transvaal Museum has an example of this genus from Koedoespoort near Pretoria (Pl. XXI, fig. 1). The specimen (length 262) does not agree very well with true *sinuatus* and still less with *zuluensis*, but I consider it a form of *sinuatus* chiefly because the length of the outer border of the pectoral shield exceeds that of the humeral. The lateral surfaces of the carapace are rounded, there is only a trace of a protuberance on vertebral IV, vertebrals II-IV longer than broad: margins of shell less acute than in *zuluensis* and posteriorly scarcely sinuate: anal shields with apices diverging: intergular shield a little broader in front than in *zuluensis*, measuring 38×19.5 . A narrow axillary shield. Costal VIII in broad contact with the abdominal shield. Snout somewhat pointed: longitudinal suture between two frontal shields longer than interorbital width. Head wholly black, without pale vermiculations: plastron mostly pale.

This specimen seems well separated from *nigricans* in the characters of the costal shields, between the limbs: these shields are well developed ventrally in a horizontal direction, much as in *zuluensis*, whereas in *nigricans* shields V-VII are more rounded. I suspect that in all adult specimens of *sinuatus* and its subspecies, vertebrals II-IV are longer than broad: in very young specimens, however, they are broader than long.

Still another form of *sinuatus* is known to me from Mpika district, N.E. Rhodesia (Text fig. 1. e). This resembles *zuluensis* in the strong development of the vertebral protuberances, the carapace is markedly sinuate posteriorly, and the lateral margins

are sharp. Gular shields a little smaller than in *zuluensis*. Vertebrae II-IV are all markedly elongate and narrow, much more so than in *zuluensis*. This probably represents a distinct race near to *zuluensis*, but I refrain from naming it owing to insufficiency of material.

PELUSIOS NIGRICANS Donn.

Of this species we have a series of fairly typical specimens from Mpika district, N.E. Rhodesia (E. Knowles Jordan), and one from British East Africa (R. Douglas). These agree sufficiently well with Siebenrock's descriptions and figure (in Voeltzkow: Reise in Ostafrika 1903-1906. tab. 5, fig. 19). They differ however from the Central African form figured and referred to by Schmidt as *nigricans*: this on the characters of the intergular shield seems worthy of separation therefrom. Another series of specimens also from Mpika district and sent by Mr. Knowles Jordan seems to represent a distinct form which I now describe as:—

Pelusios nigricans rhodesianus subsp. nov. (Pl. XXI, fig. 2 and 3 and Text fig. 1a and c). Resembling *P. n. castaneus* Schw. but differing therefrom in the form of the intergular shield: this, according to Siebenrock's figure, is broad in front and more or less pear-shaped in outline in *castaneus*, but in *rhodesianus* is somewhat diamond-shaped, pointed in front and broadest about the centre. Carapace elongate and rather high, sides smooth and rounded, vertebral shields without protuberances, the fourth fairly raised postero-mesially and a trifle broader than long, second and third a little longer than broad: sides of second vertebral divided at about the middle point. Outer borders of pectoral and humeral shields subequal in length: inner border of humeral much longer than that of pectoral. Axillary shield lacking. Costal VIII apparently not meeting the abdominal shield in full grown specimens. Plastron more or less blackened throughout. Total length of shell 218, breadth 130, height 88, length of third vertebral 43, breadth 39: length of fourth vertebral 33, breadth 35.

There are also two specimens in the collection of the Natal

Museum which seem very near to *rhodesianus*: one was labelled from Durban Bay (Col. Bowker), and the other from Mashonaland (Text fig. 1. b). Probably the Durban record is an error, the late Col. Bowker having been resident in Rhodesia. They both have a rather narrow and long intergular shield, pointed in front. Vertebrae II and III are broader than long, and the shell on the whole is rather flatter than in *rhodesianus*.

It seems quite likely that the form of the intergular shield will prove to be relatively constant, and, if so, it may be permissible to separate *rhodesianus* specifically from *nigricans* and *castaneus*. The last mentioned form is unknown to me except through the descriptions. Apparently, the specimen figured by Siebenrock came from Pemba island: in that specimen, the inner borders of the humeral and pectoral shields are more nearly equal than in any specimens of *nigricans* that I have seen.

ORDER LACERTILIA.

TROPIDOSAURA MONTANA RANGERI Hewitt.

(Annals S. Afr. Mus., vol. xx, p. 485, pl. XLIV.)

Since the description of this subspecies was published, a series of nine specimens has been received from Mr. Ranger. It is now clear that the character on which I chiefly relied in distinguishing *rangeri* is too variable for that purpose—the shape of the interparietal and frontal shields. Nevertheless, *rangeri* is well separated from the typical form both in colour and in structural characters. I am indebted to M. Angel for the following notes on the three type specimens from Cap de Bonne Espérance, now in the Paris Museum. The male has 8.8 femoral pores, females 6.7 and 7.8. In two of these specimens, each ventral scale has a deep brown spot, more or less separated from the neighbouring spots: brown spots also occur on the throat, but they are smaller than those on the belly and below the tail. In the third specimen there are no spots ventrally. There are two pale stripes laterally: the inferior one commences at the armpit and reaches to the groin. There are also traces of a brown vertebral band.

The South African Museum has specimens of this form from Table Mountain, from mountains near Zonde Ende river, and from the Sneeuwgat Pass near Tulbagh at 3,000-4,000 feet elevation. Specimens from the last mentioned locality have an imperfect gular fold or at least a trace thereof: it is more or less indicated also in a male from the Zonde Ende mountains but not in the female, nor in the two specimens from Table Mountain. Males have 7 or 8 femoral pores on each side, females generally 6 or 7, occasionally only 5 as in a specimen from Zonde Ende mountains. In all, there is a single pre-anal scale. In one case only, from Sneeuwgat Pass, there is a single post-nasal scale.

As regards the femoral pores, I have not found a single specimen with either 7 or 8 pores from the eastern districts of the Cape Province. The males from Kei Road have 5 to 6 pores, like the females, and the same may be said of specimens from Grahamstown; Hogsback, Amatola Mts.; Macleantown; Hamburg; and George Mountain. In this series, the prefrontals may be in long contact or may be just separated by the meeting of frontal and fronto-nasal scutes. There is no trace of a gular fold.

In the series from Kei Road, there are generally two superposed post-nasals, but two examples have only a single post-nasal, as in the type of *burchelli* Smith. The latter, recorded by Smith from the 'Eastern districts of the Cape Colony and Kaffirland' does not appear to be the same form as *rangeri*, seeing that the males have seven femoral pores: moreover, according to Smith's description, there are two preanal plates one in front of the other, the hindermost the largest, whereas *rangeri* has only a single preanal plate, as is normal in the species. Also, Smith's remark on the abdominal scales—those of the middle row long, transversely, seems to indicate that *burchelli* is considerably different from any known form of *montana*.

In most of the specimens in our collection, the throat and belly scales are quite immaculate, but the tail has small dark spots ventrally. There is, however, a tendency to infuscation in several specimens, although not in the form of isolated spots: in a Hogsback specimen, each ventral scale is wholly infuscated except at the margins, whilst the throat scales are only infus-

cated basally. In the type specimen of *rangeri*, each scale is crossed by a relatively narrow band of black concentric with the margin, the basal half of the scale being whitish and the margins pale: thus the belly is narrowly striped transversely black and white.

In most of our specimens, the lower pale lateral stripe commences near the nostril and extends to the thigh: it is generally well developed on the head and neck. In the type of *rangeri*, and to a much less extent in immature specimens from Kei Road, there is another broader lateral stripe just ventral to the former, extending from the axil nearly to the groin: this in life is orange, but in preserved specimens is pale.

It seems very probable that a number of local races are recognisable on the colour characters, but for the present I include all specimens with 5 or 6 femoral pores in the male under the subspecies *rangeri*.

TROPIDOSAURA ESSEXI sp. nov. (Pl. XXII, fig. 2).

Types: a series of seven specimens collected on the summit of Mont-aux-Sources, Basutoland (11,500 ft.), during January 1926, by Mr. R. Essex who presented them to the Albany Museum. These differ from the type of *Basutosaura cottrelli*, the nearest ally geographically and perhaps structurally, in more elongated dorsal scales, less flattened head, in smaller bodily size and in colour pattern. Apparently, *cottrelli* is mainly a rupicolous species, and *essexi* of grass-frequenting habits. The two forms live in close proximity on the Mont-aux-Sources.

The species is certainly related to *Tropidosaura montana*, which ranges widely over the mountainous regions of the southern Cape coast and at least as far east as the Amatola Mountains. It is at once distinguished from *montana* by the possession of a well marked gular fold. The characters are as follows:—

Head not depressed, but much as in *montana*: rostral in broad contact with fronto-nasal: nostril in a single nasal but with its hind border formed by the postnasal, well separated from rostral and from first upper labial: a fairly prominent

keel below the eye on the frenocular and subocular shields: post-nasal in contact above with the fronto-nasal and below with the first labial, sometimes also with the second labial: suture between nasal and post-nasal is well posterior to that between rostral and first labial (in *montana* those two sutures are normally in a line): 4 anterior upper labials: frontal about as long as its distance from end of snout: interparietal usually elongate, flat throughout, and in broad contact with the occipital, but in one half-grown specimen broad and quadrangular (the parietals forming a median suture behind): occipital generally present, sometimes not distinguishable from the adjacent scales: when present, its hind border generally extends posterior to the hind borders of the parietals: between supraoculars and supraciliaries granules may be quite absent or a single one may occur opposite the junction of the two largest supraoculars: three large supraoculars and in front of the largest there is always a scale or granule intervening between it and the posterior loreal: hindermost supraocular generally in contact with fronto-parietal as well as parietal, but in one specimen just missing the frontoparietal on the right side: second supraciliary by far the longest: an enlarged tympanic scale above the ear anteriorly, and in front of it one or several enlarged scales on the temporal region, the temporal scaling being variable and the differentiation of large and small scales most pronounced in larger specimens: 2 large upper temporals partly dorsal and partly lateral: all head scales smooth: pineal spot fairly conspicuous. Lower eyelid opaque, with or without a few vertically enlarged scales. Behind the head scales are one or several rows of small scales which pass rapidly and insensibly into the larger dorsal scales: the scales immediately adjoining the occipital are strongly keeled and larger than those more laterally situated. Scales of dorsal surfaces large, imbricating, strongly keeled and very acute or acuminate: at the middle of the body a transverse row has about 21 such scales. Laterally these pass into smooth lateral scales of which there are three rows. Sides of neck with small scales, becoming granular near the axil and behind the ear. Chin-shields and gular scales as in *cottrelli*: a well marked continuous gular fold.

Ventral scales of body in 6 longitudinal rows, the innermost and outermost pair composed of scales not much, if at all, broader than long, and the remaining pair of scales about twice as broad as long: the number of transverse rows of ventral scales as determined by counting the broadest scales is about 26-30. A large median pre-anal plate bordered in front by a semicircle of 5 or 6 scales of which the middle one may be enlarged. Femoral pores 7-8. Adpressed hind-limb not quite reaching the axilla in males, falling far short in female. Digits somewhat compressed laterally, with slightly tuberculate paired scales inferiorly and tuberculate soles: there are single lamellae near the ends of the digits, but elsewhere lamellae being mostly in pairs on the longer digits the under surface of each digit is minutely and irregularly furrowed along the middle: along a single line ventrally the fourth toe has about 23 scales, along dorsal surfaces of each digit a single row of scales. Scales on upper surface of thigh smooth except a few posteriorly which are keeled, of tibia well keeled. Caudal scales in equal whorls, strongly keeled and more or less like the dorsals above but not so acute: below and laterally smooth in the basal portion of the tail, but becoming keeled more distally. In all the specimens, the greater portion of the tail is reproduced, as inferred from an abrupt change of colouration: the scaling of the reproduced portion considerably resembles that of the original tail.

Above olive with stripes as follows: a black mesial stripe from occiput to base of tail: this is margined more or less definitely by a thin pale stripe on each side: a conspicuous pale dorsolateral stripe extending well into the tail: this is imperfectly black-margined: a pale lateral stripe extending from the ear to the base of the hind-limb and continued along the front of the thigh, this stripe also being more or less distinctly black-margined. Head finely spotted with dark throughout. Lower surfaces tinged with blue, tail with some black spots inferiorly, femora also with dark spots below and one or two such spots on the preanal scale.

Measurements: snout to vent 50 mm., breadth of head 8 mm., snout to ear 11.5, fore-limb 14.5, hind-limb 24.5.

The juvenile specimen belonging to this series has the following characters unlike those of the adults: the rostral is just separated from the frontonasal: dorsal scales rhomboidal, not pointed at the apex although all are keeled: between supraciliaries and large supraoculars are 2 or 3 elongated granules on each side: a well defined row of enlarged temporal shields in a line with the enlarged ear scale: head flattened, followed by several rows of small scales which are not keeled. On each side of the body and neck are two thin pale streaks, the lower extending on to the upper lip, and between them a lateral black band: below the lower pale streak is another black band and the upper pale streak is black-margined above: the upper pale streak extends for some distance along the basal part of the tail. It is of interest to notice that the dorsal scaling of this juvenile resembles closely that of adult *cottrelli*.

The discovery of this species makes it desirable to reconsider the relationships of *Basutosaura* to its allies *Tropidosaura* and *Psammodromus*. It is now clear that except on the dorsal scaling *Basutosaura* can hardly be maintained. The nostril characters do not afford important differences: in *Psammodromus*, the nostril is pierced between two labials and is in contact with the first upper labial or separated therefrom by a narrow rim: in *Basutosaura* fairly well separated from the first upper labial: in *Tropidosaura* likewise, but nostril generally between three nasals, sometimes only two. The ventral scaling of *Basutosaura* has greater resemblance to that of *Tropidosaura*, and probably expresses the closer affinity: yet the relationship of these three genera to each other is so great that we are faced with the alternatives of recognising all of them or one only. *T. essexi* has certainly an intermediate position between *Basutosaura* and typical *Tropidosaura*.

The cranial characters of a young male example of *essexi* are as follows:—

Premaxillary moderately broad at the base, but slender and with a long narrow hastate ascending process: it carries 9 teeth. Thus it resembles somewhat that of *Lacerta muralis*, but

the ascending process is quite simple in outline. Maxillary with 16 teeth. Superiorly, a narrow process from the maxilla extends backwards between nasal and prefrontal: on the right side, this process reaches the frontal, thus separating completely the nasal and prefrontal. Each nasal slightly arched from side to side: a mesial groove.

Frontal paired, the median suture being distinct throughout: slightly arched in an antero-posterior direction. Post-frontal and post-orbitals also quite distinct from each other throughout their length. A large supratemporal foramen. Lachrymal apparently absent on the left side, but distinguishable as a very small splint on the right side bounding the lachrymal foramen.

A well marked foramen parietale. The parietal is flattened throughout, but the post-frontal slopes obliquely downwards. Supraorbital region completely ossified with 3 supraoculars, the first largest: an elongated supraciliary splint: supraorbital a small triangular bone visible from the underside of the lamina supraciliaris. No ossification in the temporal region.

Mandible with 21 teeth.

If we accept Boulenger's views as to the evolution of nasal scales, it is of interest to note that the two species of very high altitude are primitive compared with typical *Tropidosaura*. The only acceptable estimate of the position within the family has of course to be based on consideration of many characters. As to these, I have sought guidance in the recently published works of G. A. Boulenger ('Monograph of Lacertidae') and of Camp ('Classification of the Lizards,' Bulletin American Museum of Nat. Hist. vol. XLVIII). According to the views of these writers, *essexi* has a good proportion of primitive characters, but is to some extent specialised or degraded in the following major characters:—

Absence of teeth on the palate:

Elongation of the rostrum, accompanied by reduction in width of the ascending process of the premaxillary (Blgr.):

Loss of the collar (Blgr.):

Lengthening and compression of the digits, and possibly slight multiplication of the scales round each digit (Blgr.).

But actually, the interpretation of these facts seems somewhat arbitrary. Pterygoid teeth are certainly of little systematic value, being present or absent in closely related species of the same genus *Lacerta*. In the truly primitive condition, there should be teeth on pterygoid, palatine and vomerine bones. Thus, all Lacertids are more or less degraded in this character.

The elongation of the rostrum, again, may have little phylogenetic significance: by some authorities, long and broad variants of skulls are attributed to environmental influences. On the other hand, the 'loss' of the collar is, I suspect, a wrong interpretation of the facts (vide infra). As regards the digital character, Boulenger tells us that the primitive condition in the genus *Lacerta* is that of *L. agilis*, which has the shortest digits and they are not at all compressed: the subdigital lamellae in that species are smooth and undivided, or divided into two. According to the same authority, the genus *Nucras* is to be regarded on the whole as the most primitive of the Lacertidae: it is described as having digits cylindrical or very feebly compressed with smooth lamellae inferiorly. Now, the digital scaling of *Nucras tessellata* chiefly differs from that of *Basutosaura* and *Trophidosaura* in that, instead of having two rows of equally developed scales along the ventral line, only one row of enlarged scales occurs: the other row is present, but the scales are smaller and pushed aside so that they may or may not reach the ventral surface. However, the condition varies much in *Nucras* according to the length of the toe: on the first toe, which is smallest, the lateral scales are small, inconspicuous and well removed from the ventral surface: on the fourth toe, which is longest, the lateral scales are nearly as big as their neighbours, and they enter the ventral surface. The difference between *Nucras* and *Basutosaura* or *Tropidosaura* is chiefly one of degree, about the same number of scales being present in both. In *essexi* however, the digits are distinctly compressed and to this

extent it may be regarded as specialised in accordance with its presumed climbing habits.

Regarding the primitiveness of these summit species, we may safely follow Boulenger in attaching importance to the following characters:—

Parietal foramen present:

A feebly depressed skull of moderate ossification:

Only slight disintegration of the head-shields, nostril in a single nasal or between two nasals. Lower eyelid simple:

No fringe in front of ear opening:

Colour pattern a simple striation; no vivid colours apparently.

To which list may be added several others regarded by Camp as of paleotelic value:—

Paired frontal bones:

Post-frontal quite distinct from postorbital.

In addition, it seems to me that the lepidosis is of essentially primitive type. Nevertheless, here again authorities appear to be divided as to the primitive lepidosis of lizards. Camp tells us that the most primitive condition in the squamation of lizards has uniform granular scales on all parts of the body. Boulenger, dealing only with the Lacertidae, expresses the opinion that large rhombic or hexagonal keeled dorsal scales are to be regarded as more primitive than smooth granules. I do not doubt but that Boulenger's view is correct. The primitive squamation of Lacertids is revealed in the relatively constant characters of the caudal scaling throughout that family even when reproduced: this contrasts with the great variability in the scaling of the dorsal surfaces of the body: it is reasonable to infer that the most primitive condition is one in which the dorsal and caudal lepidosis is uniform. This conclusion receives support from the study of lepidosis in allied families. The family Gerrhosauridae is evidently closely related to the Lacertidae, and in some respects more primitive. In this family, not a single instance of granular

dorsal lepidosis is known and the tail scaling always agrees with that of the body.

Concerning the ventral lepidosis, the presence of a collar should be regarded I think as secondary, although this is contrary to the views of Boulenger. It is here considered secondary, because of its complete absence in the allied Gerrhosauridae, and because the development of the collar seems to be accompanied by granularity or small size of gular scales which contrasting with large ventral scales is presumably not a primitive condition. The argument derived from the condition of Gerrhosaurids has the more weight because of the very considerable variation of ventral scaling known to occur in that family.

It is also probable that a rather small number of ventral scales in the Lacertidae is primitive: certainly it is the most frequent condition in the family. There are 6 longitudinal rows in *Basutosaura* and *Tropidosaura* which is also the case in several species of *Tetradactylus* (Gerrhosauridae): *Nucras* has only 6-8 longitudinal series, although its dorsal scales are numerous and granular, and in the more advanced genus *Eremias* there are also 6 rows in several species, including *nitida* which is regarded by Boulenger as a connecting link with the primitive genus *Nucras* and, which, unlike most species of its genus, has the dorsal scaling not broken up into granules: there are 6-8 rows in *Lacerta agilis* which is representative of the ancestral stock from which most species of *Lacerta* have been derived [fide Boulenger].

On the other hand, the gular fold of *Basutosaura* cannot be a primitive character if the testimony of the Gerrhosauridae is of any value. In this respect, the two summit species seem more specialised than typical *Tropidosaura*.

With regard to the colour pattern, nearly all authorities are agreed that continuous longitudinal streaks are primitive. It is interesting to note that the best developed streak both in juvenile and adult is the pale dorsolateral one which extends from the outer border of the parietal well into the basal part of the tail: this is presumably homologous with the dorsolateral streak of *Gerrhosaurus*. In the young, there is no trace of other white

streaks on the upper surface, but a conspicuous and continuous lateral streak arises from the upper lip. Later on, a continuous black vertebral band appears and this may be margined by pale streaks.

It may well be that this colour pattern is more primitive than that of *Lacerta agilis*, in which no less than 11 white streaks may occur: at any rate it agrees better with the condition in related families. It seems likely that the multiplication of the streaks is consequent on an increased number of dorsal scales.

It is clear from the foregoing that the Drakensberg species are neither wholly primitive nor very specialised. Primitive in the bulk of their characters, they nevertheless show distinct indications both of specialisation (gular fold, compressed digits) and of degradation (absence of pterygoid teeth). There is however a sense in which we may regard them and typical *Tropidosaura* as the most primitive Lacertids of South Africa if indeed it is permissible to grade the importance of characters. For the points in which they differ from the hypothetical primitive form are so trivial that they may be present or absent in closely related species: and some of them at least, such as the compressed digits, are adaptations to a particular environment. Other Lacertids can also claim a basis of primitive characters: but their non-primitive characters seem either less trivial or more numerous. Nevertheless some of these supposed primitive characters may be secondarily imposed in response to the environment: it is possible that the well developed parietal foramen, the absence of temporal osteoderms and of pterygoid teeth result from some deficiency in the food supply? Certainly *Tropidosaura mantana* is chiefly confined to grass veld regions which are notorious amongst stock farmers for a phosphorus deficiency. However, such an explanation receives little support in the behaviour of other allied genera: *Nucras delalandi* for example is found on the sour-veld mountains near Grahamstown living alongside *Tropidosaura*, but the parietal foramen is lacking and pterygoid teeth are well developed.

TROPIDOSAURA GULARIS, sp. nov.

Type: a single adult male example from Table Mountain; No. 17723 in the collection of the South African Museum, Cape-town.

Perhaps this is actually that doubtful species *T. burchelli* Smith, described from the 'Eastern districts of Cape Colony and Kaffirland,' which was reduced to the synonymy of *montana* by Boulenger; but, although agreeing in several important characters—nasal scales, preanal scales, and number of femoral pores,—it seems to be distinct therefrom in the characters of the rostral, frontonasal and supraocular scales; moreover, *montana* according to Boulenger's description, based largely on the so-called types of *burchelli*, has no gular fold, a character well developed in the type of *gularis*. The characters of *gularis* are as follows:—

Body somewhat depressed. Head elongated, slender and a little depressed: snout rather long and pointed. Parietal foramen present. Pterygoid teeth very feebly developed, represented by a single minute tooth. Neck as broad as head. Limbs of moderate length: hind limb, when adpressed, reaching forwards a little beyond the elbow. Left nostril pierced between two nasals, right between three: in the former case, the original upper posterior nasal has fused with the large anterior nasal, leaving only the inferior nasal as quite a small scale: also, the first labial enters the nostril, but the rostral is slightly separated therefrom. Second labial not in contact with the posterior nasal. Rostral angular behind: anterior nasals forming a short suture: fronto-nasal nearly 4-sided, broader than long and much longer than the suture between the prefrontals: frontal slightly shorter than its distance from the end of the snout, narrowing very slightly in the middle, being there about half as wide as long and slightly exceeding the width of the supraocular: frontoparietals much shorter than the frontal: parietals about $1\frac{2}{3}$ times as long as broad: interparietal elongate and 5-sided, about $2\frac{1}{2}$ times as long as broad: occipital moderate, its posterior border projecting slightly beyond the parietals. Four supra-oculars, first small but elongated, fourth much larger than the first but only a little longer. Four supraciliaries, first largest

but subequal to second in length. Anterior loreal appreciably shorter than the second: four upper labials anterior to the subocular which is narrowed below. A keel on frenocular and subocular shields. One or two upper temporals, in the latter case the first one is much the longer: first temporal in good contact with fourth supraocular: temple shields all smooth: a large tympanic shield and anterior thereto in the same row two smaller shields, which however are larger than the adjacent temple shields, those above in a single row of about 3-5, below a double row of about 6-8, and in front are about 10 or 11 scales.

Gular scales of moderate size and imbricate: a well distinct gular fold: along the mesial line from the mental region up to the longitudinally enlarged scales over the breast about 21 scales can be counted.

Around the middle of the body are 32 scales and plates: dorsals and laterals strongly keeled but not mucronate nor noticeably elongate, being more or less rhombic: only one row of smooth lateral scales inferiorly: ventral plates in 6 longitudinal and 22 transverse series, those of the second row from the median line much the broadest. Two large pre-anal plates, one in front of the other, the hinder one larger. Scales on the side of the neck from the tympanum to the axil all granular or subgranular, although not so minutely as in the axillary region.

Immediately behind the occiput are 3 or 4 rows of small smooth scales which pass quite gradually into the keeled rhombic scales of the upper surface. In *montana* there are fewer small scales and they pass more abruptly into the large ones (see *Annals S. Afr. Mus.* XX, pl. 44).

Scales on upper surface of tibia keeled, rhombic, and imbricate. 7 femoral pores on each side, 21 lamellar scales under the fourth toe. Caudal scales strongly keeled, excepting those at the base of the tail ventrally, which are all quite smooth.

The colour is probably much altered through the preservative: there is a very distinct thin pale dorsolateral streak extending from the head well into the tail: a broader pale ventrolateral stripe is also present between the limbs, and above

it traces of a middle pale lateral streak: the ventral scales throughout are very dark with pale edges.

Length from snout to vent 53 mm., tail 100, end of snout to forelimb 23, length of forelimb 17.5, of hindlimb 25.5, length of head to hinder border of occipital scale 13, breadth of head 8, depth from occiput to throat 6.

The South African Museum has another specimen apparently referable to this species from Sneeuwgat Pass, Tulbagh, 3,000-4,000 ft.: but, there are certain points of difference from the type, the snout being less pointed, head stouter, first supraciliary a little shorter than the second, frontal broader than the supraocular: two postnasals on both sides: on left side, rostral and first labial just enter the nostril, but on right side the rostral is shut off therefrom and first labial practically so: fourth toe with 21 lamellar scales, mostly paired, femoral pores 9-10, dorsal scales more elongated and mucronate almost as in *montana*.

Most of the ventral scales have dark spots centrally. Dorsally, many of the scales have elongated pale spots and streaks and a somewhat indistinct pale dorsolateral streak is present.

I am inclined to place *T. gularis* alongside *Basutosaura cottrelli* from the Mont-aux-Sources. The resemblance in the dorsal scaling of the body and lateral scaling of the neck is considerable: besides, they agree in the number of preanal scales and in the gular fold. *B. cottrelli* differs however in the three supraoculars, the large postnasal scale, the complete separation of nostril from first labial, the meeting of rostral with frontonasal, and in more rows of smooth lateral scales.

Apparently *gularis* and *cottrelli* are not to be regarded as independently produced derivatives of *montana* and *rangeri* respectively: they seem to be more closely related to each other than either one is to *montana* or *rangeri*. Yet, it is interesting to see that in the multiplication of dorsal and lateral scales, a character most pronounced in the neck region, there is some parallelism to the state of affairs in another family, the Zonuridae: for *Pseudocordylus* of high altitudes is specially characterised by its very numerous dorsal and lateral scales.

The relationship of the various forms to each other is indicated in the following key, from which it will be seen that *Basutosaura* can at least be employed in a subgeneric sense for the three species, *cottrelli*, *essexi* and *gularis*. These are all high-mountain forms, whereas *montana* ranges from nearly sea level over the slopes of the coastal and adjacent ranges of the Cape Province.

- A. *A single enlarged pre-anal scale. Sides of neck with moderate-sized scales.*
 - 1. Femoral pores of male 7 or 8. Traces of gular fold usually present. *montana*.
 - 2. Femoral pores of male 5 or 6. No gular fold. *montana rangeri*.
- B. *Two enlarged pre-anal scales. Sides of neck with granular scales.*
 - 3. Rostral and frontonasal not in contact: head slender: snout pointed. Two postnasals or one small one (the inferior nasal). *gularis*.
 - 4. Rostral and frontonasal narrowly in contact: head depressed: dorsal scales rhombic: one large postnasal. *cottrelli*.
 - 5. Similar to *cottrelli* but:—Rostral and frontonasal in broad contact; dorsal scales elongated and mucronate. *essexi*.

PSEUDOCORDYLUS MICROLEPIDOTUS Cuv.

Various forms of *microlepidotus* were originally described by A. Smith as distinct species. Most of them were afterwards withdrawn by their author, and in the British Museum Catalogue none of Smith's forms receives recognition. I am now satisfied however that several are indeed worthy of subspecific rank at least. Through the kindness of Mr. H. W. Parker of the British Museum, who has supplied me with copies of the various descriptions and figures, I have been enabled to arrive at the following conclusions:—

- 1. *P. montanus* Smith, figured on Pl. XXIV, fig. 1 of Smith's great work and recorded from 'Table Mountain and the hills

near Capetown,' is probably the true *microlepidotus* of Cuvier. It has the sides of the body vertically barred, femora obscurely barred transversely, the temporal scales are relatively small but sometimes a little elongate vertically, and the dorsal scales are all obtusely keeled and nearly homogeneous, those over the middle of the back being not much reduced: throat region extensively infuscated.

In our two specimens from Capetown (W. Rose), the fronto-nasal is about as long as broad and meets the rostral, as is evidently the case in Smith's figure above mentioned—but in this respect there is a discrepancy between Smith's two figures which purport to be based on the same specimen [see his Plate XXX, fig. 1]. It may also be noted that Smith represents the scaling behind the occiput very incorrectly, for those scales though small are keeled and by no means granular or even subgranular. They are actually larger than in any other known form (see Pl. XXII, fig. 3, based on a Capetown specimen).

2. *P. fasciatus* Smith, from 'rocky hills in the neighbourhood of Grahamstown' is a well marked subspecies, or even a good species, although near to the typical form. The pale cross-bands over the back are composed of isolated spots, and the sides of the body are not vertically barred: dorsal scales smooth, temporal scales small and polygonal. Over the middle of the back, especially in the lumbar region, the scales are quite small, and those behind the occiput very small. In most of our specimens from Grahamstown, the fronto-nasal and rostral scutes are well separated, but in one there is slight contact. In very young specimens, the dorsal scales are slightly keeled. We have specimens from Schurfteberg, Somerset East district, from Coetzee's Berg near Pearston (B. Marais), and from Dordrecht (L. Bland), which can also be included in *fasciatus*. Other specimens from near Butterworth (R. Essex) have quite smooth dorsal scales, but the dorsal pattern is not the same as in typical *fasciatus*, the pale cross-bands being less distinctly composed of isolated spots, and the banding extends slightly on to the lateral surfaces. A large specimen from Butterworth measures, snout to vent 160 mm., breadth of head 35 mm. Perhaps *algoensis* Smith

recorded from rocky precipices at and around Algoa Bay should also be included in *fasciatus*.

3. A very distinct form, to which we may apply Smith's name *P. subviridis*, occurs on the Drakensberg mountains. It is figured on Pl. XXVI of Smith's 'Zoology of Southern Africa,' but is there without a varietal name and I have identified it with the earlier described *subviridis* merely on the evidence of the colour. This form is at once recognisable through the vertically elongated temporal scales. I have examined a series of 40 specimens of all sizes taken from the summit of Mont-aux-Sources (R. Essex), from Thaba Putsua, Rebaneng Pass, and Malutsenyane Falls (J. A. Cottrell), in each of which there is a series of 4-6 vertically elongated temporal scales superiorly: these are present even in late embryos. This form is also known to me from Doornkop near Belfast, Transvaal (R. Gerhardt), from Katberg, C.P. (R. Essex), from Hogsback (G. Rattray) and from Ugie (Miss L. Britten). It does not generally reach such a large size as *fasciatus*, our largest example from the Drakensberg measuring 120 mm. from snout to vent, greatest breadth of head 32: the Ugie specimen is however larger, the breadth of head being 34. In *subviridis* the pale spots of the dorsal surface are mostly elongated longitudinally and do not form crossbands. The Drakensberg specimens were all found under stones but Mr. Essex believes that *subviridis* may be a burrower: he found one specimen near the summit of the Katberg at the inner terminus of a long burrow which extended horizontally in the soft earth for a distance of about sixteen feet.

4. Three specimens in the collection of the South African Museum, labelled 'Namaqualand,' seem to represent a fourth form now described as *Pseudocordylus microlepidotus namaquensis* subsp. nov. (Pl. XXIII, fig. 1). The characters are as follows:—Frontonasal and rostral well separated, the former broader than long: scales immediately behind occiput small but not subgranular: dorsal scales not simply keeled, but with slightly raised centres and finely ribbed, stellate fashion, towards the periphery: temporal scales rather few—about 8—referable to

two rows, those of upper row enlarged and somewhat elongated vertically: two or three prominent enlarged scales on the anterior boundary of the ear, which scales may project strongly outwards: small scales along mesial region of throat not elongated but more or less rounded or squarish—in true *microlepidotus* they are mostly elongated like the scales lateral to them. Colour pattern not easily made out in the specimens, but the throat is without infuscation. Length from snout to vent 127 mm.

Type: No. 872 in coll. S. African Museum.

An old specimen from Beaufort West in the same collection can also be referred to *namaquensis*.

This variety is a brachycephalic form of the species, nearly related to the typical form of the Cape Peninsula.

As to the genetic relationships of these forms, if we regard the genera *Zonurus*, *Pseudocordylus* and *Platysaurus* as forming a simple evolutionary series in ascending order of specialisation, then *subviridis* is the most specialised form of its genus, and *microlepidotus* s.s. the most generalised: for, the vertically elongated temporal scales of the former are a *Platysaurid* character, and the keeled dorsal scales of *microlepidotus* s.s. approach the supposed primitive *zonurid* type. It certainly seems permissible to regard the almost homogeneous dorsal scaling of *microlepidotus* as more primitive than the heterogeneous scaling of *subviridis*.

Here, it may be remarked that the genus *Pseudocordylus* is by far the highest in altitudinal range. It probably occurs on or near the summits of all our mountains. So, in this family, it seems that the most elevated form is not the most primitive in structure, so far as the scaling of the body is concerned. unless we choose to regard the presence of osteoderms in *Zonurus* as secondary.

All these genera are to some extent rupicolous, *Platysaurus* entirely so, *Pseudocordylus* at any rate entirely restricted to mountains, whilst *Zonurus* sometimes lives on open sandy plains as a burrower, and is sometimes partially arboreal, but is mainly of rupicolous habits.

PACHYDACTYLUS CAPENSIS subsp. nov. *OCULATUS* (Pl. XXII, fig. 1). Type: a single male specimen taken on the farm Cyrilhurst about six miles from Tarkastad, C.P., by Mr. Robert Essex in August, 1925. This subspecies is at once recognised by its remarkable colour pattern, and in other respects has characters which are more or less intermediate between those of *capensis* Smith and *maculatus* Gray, so that *oculatus* might reasonably be referred to either species. The type locally is moreover in an intervening region between the areas of these two species, *capensis* ranging widely over the high plateau and central districts of the Cape, whilst *maculatus* is limited to the coastal and adjoining districts as far inland as Queenstown. However, from another locality in the Tarkastad district we have a young example of what may fairly be regarded as typical *capensis*, and from the same district we have also typical *maculatus*: so *oculatus* may be merely a hybrid. The characters of *oculatus* are as follows:—Nasorostrals separated by a single moderate-sized granule, scales over snout small and granular, becoming subconical though small just before the orbit, mostly granular over the occiput but the granules of varying size, on the back with large and small granules closely intermingled, the former subconical, the latter not strongly flattened but tending to become subconical, each larger scale being generally surrounded by a single ring of smaller ones, the mid-dorsal line devoid of enlarged scales: scales adjoining mental and lower labials all minutely granular, and all the scales on the throat small and granular, under neck, on breast and belly flattened and imbricate, mid-ventral and ventrolateral scales subequal in size. Subdigital lamellae 5, including the small divided distal lamella: scales along the mid-ventral line flattened like the rest of the scales but not enlarged. On each side of the vent, a pair of enlarged subconical scales. Upper surface of hind-limb with enlarged subconical scales both on femur and on tibia, those on the femur a trifle larger.

Above light brown with four series of elongate oval blotches along the back and neck: each blotch is brown with a conspicuous creamy white edge, and the brown becomes darker, almost

black towards the margin. The median blotches arranged in pairs are the largest, and their white edges coalesce to some extent. At the side of the head, a dark band extends from nostril to above the ear: this band closely approaches the first median blotch, which is obliquely arranged. Upper surfaces of head and of limbs pale brown with small dark irregular spots. Reproduced tail light brown with irregular dark blotches.

Length from snout to vent 37.5 mm.

A juvenile specimen possessing an original tail has a regular series of blotches continued along the upper surface of the tail.

This form differs from *maculatus* in the more pronounced differentiation of dorsal tubercles and the scales throughout are not so minute, the nasorostrals for instance, being separated by several granules in *maculatus*. On the other hand, the scales of the head are more granular than in *capensis*: in the latter, the scales adjoining the mental and lower labials are small and flat or sometimes granular.

It may be added that *maculatus* is not constant in the pattern and scaling of the dorsal surface. The spots may be large or small and may be edged with white or partially so. The dorsal scales may be all more or less of equal size, as in a specimen from Tarkastad: or, as in a male from Port Alfred, the enlarged scales may be very conspicuous, conical and sharply pointed and those on the tibia and at the base of the tail laterally very large and sharply pointed.

PACHYDACTYLUS SCUTATUS sp. nov. (Pl. XXIII, fig. 2).

Type, a single specimen in the collection of the South African Museum (No. 17471) collected by Mr. R. F. Lawrence at Kowaris, S.W.A. The species is related to *montanus* Meth. and Hwtt.,* from the Karasberg Mountains (see Pl. XXIII, fig. 3), but is easily distinguishable through the scaling of the dorsal surface, the large scales being contiguous in *scutatus* but well separated by granules in *montanus*.

*Annals Transvaal Mus. IV, p. 129, 1913.

Head rather large but flattened, snout long and pointed, about $1\frac{3}{5}$ times as long as the breadth of the eye which is fairly large: ear opening elliptic, oblique or nearly horizontal: rostral rectangular, about twice as broad as deep, just entering the nostril on each side: nasorostrals in long contact, two other nasals, first labial and rostral all bordering on the nostril: symphisial shield elongate, more than twice as long as broad, narrowing a little posteriorly where however it is almost as broad as the first labial: nine upper labials, seven lower ones: scales on snout flattened and more or less subequal, larger than any on the occiput: the latter scales include quite small subgranular ones and others much larger which are somewhat keeled, elevated and almost subconical: on the temporal region slightly larger keeled scales occur and over the neck enlarged keeled scales predominate, the intervening small scales being few and scarcely noticeable: over the greater portion of the back and flanks, these imbricating enlarged and strongly keeled scales occur exclusively, the largest of them being situated dorso-laterally in the lumbar region: the much smaller smooth scales are restricted to a narrow mesial strip in the lumbar region: enlarged keeled scales also occur over the upper surfaces of thigh and leg, but on the forelimb the keeled scales of the anterior surfaces are smaller: belly scales all small, smooth and imbricate, those over the throat and chin region much smaller still.

Tail lacking in the specimen, but in juvenile specimens it is cylindric and conspicuously-ringed above, each annulus having two or three rows of small smooth scales, followed by a single row of four to eight much enlarged strongly keeled scales: ventrally, however, there is no trace of annulation, the scales being smooth: reproduced portions also are not annulate, but the dorsal scales thereon are faintly keeled. On each side of the vent basally a pair of enlarged smooth scales. Expanded portions of digits with 6 lamellae inferiorly, the terminal one being divided: in addition, the scales of the median row of each digit inferiorly are all transversely elongated, the middle toe having nine such enlarged scales, and the middle finger six.

Head with a conspicuous colour pattern as follows—on each side a black stripe beginning in the loreal region, continued behind the eye, above the ear opening to the occiput where it curves inwards to meet its neighbour: behind the eye, this black stripe constitutes the upper border of a white stripe which again is more or less distinctly bordered below with black: the main black stripe also is bordered above by a short white one just behind the eye and another along the ill-defined rostral canthus. Upper surfaces of body and of head with indistinct and irregular dark spots and blotches.

Length from snout to vent 42 mm., greatest breadth of head 9 mm.

Young specimens have the conspicuous head markings well-developed but no black spots on the dorsal surfaces.

The various known forms of the genus may be distinguished as follows:—

KEY TO SOUTH AFRICAN SPECIES OF *PACHYDACTYLUS*.

1. *Dorsal scaling homogeneous and none of the scales on body or limbs enlarged into tubercles.*

A. Rostral bordering on the nostril.

- a. Subdigital lamellae 5 or 6, median subdigital scales transversely enlarged. Touws River, C.P., to Great Namaland. (Includes *pardus* Sternf. from Warmbad, which is a local form or perhaps subspecies.) *purcelli* Blgr.

B. Rostral not bordering on the nostril.

- b. 3 subdigital lamellae under third toe, but subdigital scales not enlarged: nasorostrals in contact: dorsal scales a little larger than ventrals. Western and central districts of Cape as far east as Fort Brown, and northwards to Free State, Kimberley, and perhaps Bechuanaland.

mariquensis Smith.

- c. Resembling *mariquensis*, but symphyisial scale much narrower behind than the first labial. Port Nolloth.

austeni Hewitt.

- d. Resembling *mariquensis*, but nasorostrals separated by several small scales. Victoria West to South-West Kalahari. *latirostris* Hewitt.
 - e. 4 or 5 subdigital lamellae, median subdigital scales slightly enlarged: scales on snout 3 or 4 times as large as those on back of head: snout about $1\frac{1}{3}$ times as long as diameter of orbit: rostral shield about twice as broad as deep. Tette and Sena. *punctatus* Ptrs.
 - e'. Similar to *punctatus*, but snout longer, about $1\frac{2}{3}$ times as long as diameter of eye: subdigital scales apparently more enlarged: upper labials 8 or 9, lower ones 6. Bulawayo to Bechuanaland Protectorate, Ovamboland and Namaland. *punctatus brunthaleri* Werner.
 - e". Like *brunthaleri*, but upper labials 8, lower labials 7. Greater portion of dorsal surface of body black, lumbar region greyish white. Kaokoveld S.W.A. *punctatus bicolor* Hewitt.
 - f. Scales of snout not much bigger than those on back of head: snout a little longer than diameter of eye: rostral not or only slightly broader than deep: nasorostrals usually separated: subdigital lamellae 4 or 5, subdigital scales somewhat enlarged. South-West Cape Province eastwards to Mossel Bay. *ocellatus* Cuv.
 - g. Resembling *ocellatus*, but 5 to 6 subdigital lamellae, rostral twice as broad as deep, snout $1\frac{1}{2}$ times the diameter of eye, nasorostrals separated. Kamaggas, Little Namaqualand. *amoenus* Wern.
 - h. Similar, but rostral a little broader than deep, snout $1\frac{2}{3}$ times the diameter of the rather small eye, nasorostrals in contact, subdigital lamellae 6. Chamis, Gt. Namaland. *serval* Wern.
2. Dorsal scales usually heterogeneous, some of the scales, occasionally the majority, being enlarged into tubercles.
 - A. Tubercles small and conical, distinguished from the adjacent granules only by their larger size, sometimes scarcely distinguishable.

- a. Subdigital lamellae 3 or 4, subdigital scales not enlarged: scales adjoining lower labials and symphyisial granular and smaller than those behind them: nasorostrals widely separated: ventral scaling subgranular, or somewhat flattened and subimbricate: tibia with conical tubercles above. Central and Eastern districts of Cape eastwards to North Zululand. *maculatus* Gray.

B. Tubercles larger, either conical, subconical, keeled or rarely smoothed.

(I) *Ventral Scales all granular.*

- b. Resembling *maculatus*, but dorsal tubercles larger, conical and spinose: subdigital lamellae 4 or 5, subdigital scales not or only slightly enlarged. South Kalahari to Little Namaland. *rugosus* Smith.

(Perhaps only a subspecies of *maculatus*.)

(II) *Ventral scales smooth, flat and imbricate.*

- c. Somewhat resembling *maculatus* except in ventral scaling: femoral and dorsal tubercles mostly subconical: scales in mental and gular regions all quite granular, but becoming flat and imbricate under the neck posteriorly; nasorostrals separated by a large granule: scales on snout granular; 5 subdigital lamellae. Tarkastad.

capensis oculatus subsp. nov.

- d. 4-5 subdigital lamellae, subdigital scales not enlarged, or not very much so (*tigrinus*): scales on snout more or less enlarged, not granular: tubercles on back keeled: rostral and first labial not entering the nostril.

capensis Smith and subspecies.

1. Scales on snout and on head large, smooth, and flat; tubercles on back tending to be subconical although weakly keeled. Nyassaland, North and South Rhodesia.

capensis O'Shaughnessyi Blgr.

2. Scales on snout and on greater part of head not quite flat, granules on hinder part of head intermixed with tubercles: dorsal tubercles large, moderately keeled;

scales adjoining mental and first labial small or very small; nasorostrals in contact in adult specimens: subdigital lamellae 5-6. Body spotted. Zululand. Transvaal and Bechuanaland Protectorate southwards to Cape Province except coastal districts.

capensis capensis Smith.

3. Similar, but dorsal tubercles very strongly keeled, often trihedral: subdigital lamellae 4 or 5. Body cross-barred. Western parts of Cape Province from Ceres to Little Namaqualand. *capensis formosus* Smith.
4. No enlarged tubercles on hinder part of head which is considerably flattened: dorsal tubercles small, more or less strongly keeled, and with intervening granules: nasorostrals separated by a granule in type, but generally in contact: scales adjoining mental and first labial granular. Back spotted, and with traces of 5 or 6 thin white cross-stripes. Rustenburg district to South Rhodesia (perhaps also Barberton district). *capensis affinis* Blgr.
5. Near to *affinis*; nasorostrals in contact: dorsal tubercles ill developed and weakly keeled, and granules absent or nearly so: scales adjoining mental and first labial finely granular. Body with 5 well defined thin white cross-stripes. Zoutpansberg district. *capensis tigrinus* van Dam.
- e. Resembling *maculatus* in markings and *capensis* in scutellation, but with a well defined row of 5 or 6 chin shields: subdigital lamellae 4: nasorostrals separated by a single flattened scale. Longhope, near Somerset East. *mentalis* Hewitt.
- f. Resembling *capensis*, but subdigital lamellae 6-9, and an inferomedian row of transversely elongated scales on the digit: dorsal tubercles large, strongly keeled, trihedral. Namaqualand. *fasciatus* Blgr.
(Perhaps a subspecies of *capensis*.)

- g. Rostral and first labial entering the nostril: nasorostrals in contact: dorsal scales rather small and well separated by granules: subdigital lamellae 7. Karas Mountains, S.W.A. *montanus* Meth. and Hew.
- h. Like *montanus*, but dorsal scales large and contiguous. Kowaris, Kaokoveld. *scutatus* Hwtt.
- i. First labial but not the rostral entering the nostril. Nasorostrals not in contact. Subdigital lamellae 5-6. Little Namaqualand: (also recorded by Werner from Keetmanshoop and Karibib). *weberi* Roux.
- j. Subdigital lamellae 10-12, subdigital scales not enlarged. Head with moderate sized, flattened, convex or bluntly keeled scales, largest on the occiput. From Cape to Angola and Mozambique. *bibroni* Smith.

Various subspecies and local forms occur, amongst which are:—

1. Dorsal tubercles with strong simple keels, in places subtriangular. Cape Province. *bibroni bibroni* Smith.
 2. Dorsal tubercles stellately keeled. Gt. Namaland. *bibroni stellatus* Werner.
 3. Dorsal tubercles smooth or very feebly keeled. S.W. Africa. *bibroni laevigatus* Fischer.
- k. Scales on head very finely granular; rostral entering nostril. Subdigital lamellae 12: dorsal tubercles flat, smooth, unequal in size. Little Namaqualand. *namaquensis* Sclat.

OEDURA NIVARIA Blgr.

The type is said to have 'nostril between five scales, the upper largest and separated from its fellow by a granule.' I have seen no specimens agreeing with the type in this respect. In two examples from Herschel, one from Cala, and a young one from Masete, there are three nasals, and the first upper labial enters the nostril but the rostral is well separated therefrom: the latter shield is 5-sided. In a young specimen from

Tugela River, Mont-aux-Sources, about 5 miles from the Tugela Falls (coll. Robt. Essex), the rostral is 4-sided and at its extreme upper corners just enters the nostrils. This specimen is also remarkable in the two median chin-shields which adjoin the mental: they are elongated, considerably longer than broad and the shield on each side is also longer than broad. The mental and first pair of labials are in contact with 6 chin-shields instead of with 4 or 5 as in the other examples above mentioned. When a series of specimens is available, this may seem worthy of subspecific rank.

The distribution data of the species of *Oedura* in this region is as follows:—

nivaria Blgr. is a Drakensberg species, first taken on the summit, and known to me from Herschel and from Cala.

tembulica Hwtt., first described from Cofimvaba, has been found by Mr. Essex at Braam Nek near Imvani, at Nanusi's Nek, Queenstown, and at Mackay's Neck south of Cala. The characters are not altogether constant, specimens from Braam Nek and one from Mackay's Nek having the large nasals in contact. I distinguish the species from *nivaria* on the nostril character and from *amatolica* on the shape of the mental shield.

amatolica Hwtt., first described from Hogsback, is also known from the summit of the Katberg (R. Essex) and from Stutterheim.

karroica Hwtt. is based on a specimen alleged to have been found in the Albany District.

karroica subsp. *wilmoti* Hwtt., first described from Tarkastad, occurs also on the farm Hopewell south of Tarkastad towards the slopes of the Winterberg and at Graaff-Reinett (R. Essex), also we have a young specimen apparently referable thereto from the summit of Coetzees Berg near Pearston (B. Marais).

SEPSINA HESSEI sp. nov. (Pl. XXIII, fig. 4).

Type: a single specimen in the collection of the South African Museum (No. 17481) taken at Kaoko Otavi, S.W. Africa,

by Mr. R. F. Lawrence. The specific name is in recognition of Dr. A. J. Hesse's co-operation in collecting the reptile fauna of the Kaokoveld.

This species, being tetradactylous, is apparently related to *S. tetradactyla* Ptrs., from Zanzibar coast, but is distinguishable on the colour pattern, on the shape of the frontal, and on the characters of the hind-limb, the fourth toe being only as long as the second in that species.

Head depressed, snout obtuse and rounded, only slightly projecting: rostral very broad, more than twice as long as broad, considerably shorter than the frontonasal and only a little longer than the supranasals: loreal about twice as long as broad: four supraoculars, first considerably the largest, last smallest: four supraciliaries: lower eyelid scaly: frontonasal seven-sided: frontal quite as broad as long, concave behind and very slightly so at the sides: interparietal of moderate size, a trifle broader than long, but much narrower than the frontal: parietals obliquely elongated, about $2\frac{1}{2}$ times as long as broad: each parietal is succeeded by a series of about 4 obliquely elongated scales, the first longest and the others gradually lessening: also, mesially one or two pairs of transversely elongated scales follow the parietals: fourth upper labial is subocular. Ear opening minute.

Twenty-two scales round the middle of the body.

Limbs short, each with four digits.

Fingers all very short but with relatively strong claws: second and third subequal: first and fourth subequal, but a little shorter and weaker than the other pair. Toes all with strong claws: third and fourth subequal, moderately long: second much shorter, first very short.

Dorsally, all the scales of head, body and tail are pale greyish with yellow or golden tinge and with conspicuous blackish margins. Tail bluish. Lower surface of body dirty grey.

Total length 73 mm., tail 33, fore-limb 4, hind-limb 6.5, end of snout to ear opening 5.5.

The genus *Sepsina* seems to be extremely rare in South

Africa, the above specimen being apparently the only one in any of the South African Museums.

It is said to differ from *Scelotes* as follows:—palatine bones separated (meeting in *Scelotes*): no nasal scale (very small, sometimes reduced to a narrow ring in *Scelotes*). Now, in the apodous species of *Scelotes* at any rate the character first mentioned is certainly not of generic importance: and the importance of the nasal character is very doubtful in view of its known variation in *Scelotes*, one species, *brevipes*, showing no trace of a ringlike nasal in some specimens (see Records Albany Museum III, p. 356, where it is referred to as postnasal). A more striking point of difference between the two genera is in the size of the interparietal scale, small in *Sepsina* but large and broader even than the frontal in *Scelotes*. Yet, *Sepsina grammica* Cope is said to have the interparietal large and nearly as wide as the frontal.

Other lizards recently taken in Basutoland are:—

Agama atra Daud. Hope's Mountain, Basutoland (J. Cottrell).

Mabuia striata Ptrs. Hope's Mountain, Basutoland (J. Cottrell).

Eremias burchelli D.B. Hope's Mountain, also Nemahedi Police Camp (J. Cottrell). It agrees fairly well with the Grahamstown form. A young specimen is marked as follows: above, 6 thin continuous white stripes along the back which is otherwise black, also a seventh which is short and ends just behind the shoulders. The middle pair of white stripes meet at the base of tail: the dorsolateral pair continue as such along the upper surface of the tail.

Class BATRACHIA.

RANA VERTEBRALIS sp. nov. (Pl. XXIV, fig. 2).

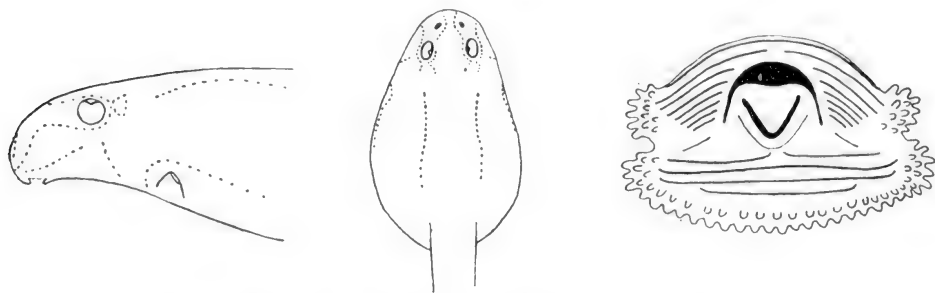
Type: a single immature specimen from a stream near the summit of Mont-aux-Sources, at the source of the Tugela River, collected by Mr. Robert Essex, January 1926. Five still smaller specimens were taken at the same time.

Differs from its near ally *fuscigula* D.B. as follows:—snout considerably shorter; head rather broad and depressed; tympanum small, its width less than the distance from its margin to the posterior angle of the eye: toes very slender, subarticular tubercles very weak: sternum very short and broad, constricted in the middle, strongly expanded distally; an elongated grey mark mesially just behind the shoulders—being a remnant of the median stripe frequently found in *fuscigula*—and immediately in front of it a A-shaped dark mark: between the eyes a dark transverse band, more or less like a flattened V, which is pale-margined in front: side of head without a trace of the usual oblique pale stripe of *fuscigula*, being indefinitely mottled dark and light: legs with dark cross bars: those on the femora not much broader than the grey interspaces: lower lip with dark spots: femora yellow below. Length from snout to vent 38, breadth at gape 14.7. The grey mark on the middle of the back occurs on all six specimens, but the shape and degree of development varies much.

A single adult female from Rebaneng Pass (J. A. Cottrell) is probably of the same species: owing to imperfect condition, the dorsal markings cannot be made out, but other characters are as follows:—tympanum much smaller than in adult specimens of *fuscigula*: head depressed and broad, but snout rather pointed, although not long; foot tubercles all weak and feet entirely webbed: tibio-tarsal joint of adpressed hind-limb reaching to the eye. Side of head without pale stripe: throat and chest marked with an infuscated open network: thighs below with yellow tinge. Length from snout to vent 101 mm., of hind-limb 155, breadth at gape 45, breadth of tympanum 5.

The exact status of this form is a little doubtful. The small tympanum at once separates it from any known form of *fuscigula*, but it may be noted that size of tympanum is by no means constant throughout the range of that species. Specimens from Kuruman, Modder River, Victoria West, Robertson and Tafelberg have tympana distinctly larger than in examples from Strand and Simons town. *Vertebralis* is therefore in this respect nearer to

the Cape Peninsula form of *fuscigula* than to that of the Central districts. This variation in size of tympanum may be connected directly with environmental influences, but the fact that *angolensis* with large tympana is common at high altitudes in Basutoland and was taken near the summit of Mont-aux-Sources, makes such hypothesis doubtful. Nevertheless in other parts of the world a reduced auditory apparatus seems to be a feature of both frogs and lizards at high altitudes.



Text figure 2. Tadpole of *Rana vertebralis* sp. nov.
 shewing distribution of sensory canals and oral apparatus
 (Drawn from preserved specimens which are somewhat distorted.)

Some peculiar tadpoles (Text fig. 2a-c) that I refer to this species were taken by Mr. Essex in a pool near the summit of Mont-aux-Sources, and by Mr. Cottrell at Thaba Putsua: the former in the same place as the type of *vertebralis*. They differ greatly from Kimberley tadpoles of *fuscigula*, or Grahamstown specimens of *angolensis*, or Capetown specimens of *grayi*, but in the webbing of the tail seem definitely akin to the two former. The characters of specimens in which the hind-limbs are just commencing to show are as follows:—

Oral disc ventral and large, much larger than in *fuscigula* or *angolensis*: lower lip entirely fringed by two or more rows of small papillae, which extend also on to the upper lip, terminating opposite to the point of origin of the outer row of teeth: at the sides, the papillae are only in a single row: 8 upper rows of teeth, only the outermost entire: 4 lower rows of teeth,

the innermost just divided in the middle, and in addition there is an ill-developed accessory row internally obliquely disposed on each side: bony jaws only moderately developed, not nearly so powerful as in *gracil.* lower one V-shaped, its margin broadly margined with black but the greater portion of the jaw is pale and comparatively soft. Tail about 1½ times as long as body, obtuse at the end, the web narrow and ill-developed, broadest in the distal half, the upper crest extending forward to a point dorsal profile of tail fairly straight. Interocular space about equal to breadth of oral disc and almost twice the distance between the nostrils.

Head and body ovoid, somewhat depressed, head rounded, abdomen convex though not very strongly. Lines of sensory spots conspicuous owing to their black colour (see fig.). Dorsal surfaces obscurely mottled grey and blackish; ventral surfaces of body and tail white; sides of tail blackish, or grey with black spots: web of tail either devoid of black spots, or the dorsal web may have black blotches throughout its length, and the ventral one in its distal portion.

Length of head and body 16, breadth of body 10, length of tail 23; height of body (approximately) 0.5.

In the characters of the oral disc, this species is at once distinguished from any yet described from this country. It seems almost certainly a near relative of *fascigata*, and the tadpole characters are best interpreted as secondary, being in some way a result of the peculiar environmental conditions—cold mountain torrents and rocky watercourse. It is particularly interesting to find that there is another mountain species of *Rana* with similar modification in the oral disc of the tadpole: it is *Rana alticola* from mountain streams in the Siamese Peninsula (see Records Indian Museum XXVI, p. 139, Pl. VII, fig. 5b, 1934, 'Descriptions of Indian and Indo-Chinese Tadpoles' by M. A. Smith). It may also be remarked that this modification is an approach to that which has taken place in one of the Bufonid genera when placed under somewhat similar conditions—the genus *Heleophryne*.

RANA FUSCIGULA ANGOLENSIS Boc.

Basutoland records are:—Qeme Vlei (J. A. Cottrell): mountain streams near Putsua and Maluti Falls (J. A. Cottrell); summit of Mont-aux-Sources, a small specimen (R. Essex). All these specimens have sharply pointed snout and colour markings as in ordinary *angolensis* of the Eastern Cape Province. The Qeme Vlei specimens are very large, breadth of gape in female 46 mm., and the feet are rather more webbed than in ordinary *angolensis*, thus resembling typical *fuscigula*.

RANA GRAYI Smith.

Basutoland records are:—Summit Mont-aux-Sources and Mont-aux-Sources, Natal side (R. Essex); Thaba Putsua (J. A. Cottrell). These are more or less typical specimens.

Besides, there are two specimens from Nemahedi Camp and from Thaba Putsua collected by Mr. Cottrell in January 1925 and January 1926 respectively which I regard as hybrids between *grayi* and *vertebralis*. They have the vomerine teeth of *grayi*, subarticular tubercles well developed, but the feet are webbed and the head is broad and depressed: the bony sternum is stouter than in *grayi* and somewhat expanded distally, but is not so short as in *vertebralis*. One of these specimens, an adult female, measures 58 mm. from snout to vent: it has feet two-thirds webbed, the other specimen being half webbed. The markings are rather characteristic: between the eyes a blackish patch shaped like an inverted triangle, and pale-margined in front: in the middle of the back a pale patch: limbs with conspicuous dark cross bars, a specially broad one across the middle of the femur and tibia.

But for the fact that these specimens were taken in a region where ordinary *grayi* and *vertebralis* is known to occur, I should certainly have considered them worthy of specific distinction.

KASSINA WEALII Blgr.

The Capetown form of this species is distinguishable from those found in the eastern districts of the Cape Province in the pattern of the dorsal surface: also, it is smaller than the typical

variety. This western form now designated *Kassina wealii quinque-vittata* subsp. nov. (Pl. XXIV, fig. 4) has on the upper surfaces of the body five conspicuous dark stripes on a greyish background (in preserved specimens): these stripes are unbroken apparently so at all stages. The lateral stripe however is sharply defined only on its upper edge: below, it merges to some extent with the infuscated network on the flanks. Mesial stripe broadest in front and commencing slightly behind a transverse line joining the anterior angles of the orbits. Besides, there is another pair of stripes on the head: this on each side starts at the nostril and terminates behind the tympanum immediately below the commencement of the lateral body stripe. Thus the pattern of the upper surfaces of head and body is actually referable to seven dark stripes

In adult male, the tarso-metatarsal joint of adpressed hind-limb extends as far as anterior border of eye. Outer metatarsal tubercle very small. Snout broadly rounded. Length of adult male from snout to vent 30 mm., breadth of disc on throat 6 mm. Type, an adult male in the South African Museum, collected by Mr. W. Rose.

In Eastern Province specimens of this species, the body stripes are more or less broken up: the young have only three continuous stripes on the back which may persist up to the adult stage.

HYPEROLIUS HORSTOCKII (Schlegel).

Two forms of this species are recognisable, the one from Capetown, the other from Natal and Eastern Cape Province. No original description having been published, and Seba's figure on which the species was founded being useless, the locality record is my only available clue to the typical form: it is 'Vorgebirge der guten Hoffnung' which clearly indicates the Capetown neighbourhood—the 'northern part of Cape of Good Hope' as given in Noble's check list being a little ambiguous.

The chief characters of typical *horstockii* (Pl. XXIV, fig. 1 and 6) are: snout rather pointed and slightly projecting: interorbital space about $1\frac{1}{3}$ times as broad as the upper eyelid:

tibio-tarsal joint of adpressed hind-limb in male reaching to middle of eye: throat-disc of male large and well-defined, even in front being generally marked off by a fold from the skin of the mental region. Upper surfaces ashy or pale brown: dorso-laterally, a long white stripe extending from tip of snout to the inguinal region, and almost reaching the vent, but reduced to a very thin streak posteriorly: anteriorly the two stripes meet: sometimes they are faintly dark-edged superiorly: inferiorly there is always a blackish or dark margin, and sometimes this takes the form of a fairly broad dark lateral band which again from below the eye to the shoulder or a little beyond is bordered below by a second whitish stripe. This shorter ventral white stripe is ill-developed in the palest specimens. No white spots on the back or limbs. Length of adult male from snout to vent, 32.5 mm., breadth of throat-disc 9. Above description based on an adult male from Capetown (W. Rose).

This species, according to Boulenger's check list (1910), was considered peculiar to Cape Colony, but in Noble's list (1924) the range is given as South Africa as far north as Northern Rhodesia. Probably the typical form is restricted to the south-west districts of the Cape. We have specimens of an eastern variety from the following localities:—Redhouse near Port Elizabeth; Bussacks near Kariëga River mouth; Blaauwkrantz near Grahamstown; Mqanduli; Mariannhill, and Gillets, Natal.

These specimens, now designated *H. horstockii semidiscus* subsp. nov. differ from typical *horstocki* as follows: snout not so pointed, interorbital space rather wider, being at least $1\frac{1}{2}$ times as broad as the upper eyelid, throat-disc of male not separable from the mental skin in front: no white streak from below eye to the shoulder: upper white streak extending backwards only as far as the sacral region. This white streak is always very conspicuous but varies considerably in width, being wide or narrow in specimens from the same locality: in the latter case, it may be lacking on the snout and even above the eye. There are often small white spots on the leg and fore-limb, and sometimes a few on the body. The type specimens have the upper surfaces bluish in spirits (probably green in life) and the

white dorsolateral streak is not conspicuously dark-bordered below. Types from Mariannhill, Natal, collected by Rev. P. Boneberg (Pl. XXIV, fig. 7). Length of adult male, from snout to vent 33.5, breadth of throat disc 9.5. The Natal specimens are a little larger than those from the Bathurst district which also are greyish or pale brown somewhat like typical *horstockii*.

It may be added that Boulenger's description of *horstockii* in the British Mus. Cat. Batrachia salientia (p. 120) was probably based mainly on specimens of this eastern form.

BUFO GARIEPENSIS Smith.

We have specimens from the following localities:—Resolution, near Fort Brown (Miss A. Walton): Committees (G. Collier): Hounslow, near Grahamstown (J. Hewitt): Healdtown (J. Hewitt): Klerksdale, near Middelburg (B. Marais): Schurfteberg, Somerset East district (B. Marais): Nanusi's Nek, near Queenstown (R. Essex): top of Stormberg, near Dordrecht (R. Essex): near Burghersdorp (R. Broom): 20 miles north of Steynsburg (Miss Brown): Majuba Nek, Herschel district (J. Hepburn): Douglas (R. Broom): Victoria West (P. D. Morris): Steinkopf (H. Zerf).

Also, Mr. J. A. Cottrell took it from high elevations in Basutoland, viz.: near Maluti Falls; Qeme Vlei; Rebaneng Pass; and Thaba Putsua.

The very wide distribution of *gariensis* shows that this species is not, as I once thought, merely a Karroo form of *regularis*. Occurring as it does from the highest elevations in South Africa down to almost sea level in the Cape Province and extending very widely throughout all the central and western districts of the Cape, this species is probably a member of the primitive Bufonid stock, whilst *regularis* on structural and distributional grounds may be considered a more recent arrival.

It is a stout form with toes not webbed, foot tubercles strong, well-marked tarsal fold, parotoids oval often broadly so but varying considerably in shape: the young has black spots on the chest and sometimes a few on the throat and mental region.



mark beneath the eye. Total length 32 mm., specimen from foot of Nemahadi Pass 40 mm.

Lastly, other species of *Anura* collected at a lower altitude in Basutoland, near Masite (5,600 feet), are:—*Rana delalandi* D.B., *Cassina senegalensis* D.B., *Cacosternum boettgeri* Blgr. and *Bufo vertebralis* Smith. These were taken recently by Mr. E. Ford.

XENOPUS POWERI sp. nov. [Pl. XXIV, fig. 3.]

Type: a single specimen now in the MacGregor Museum, Kimberley, collected at the Victoria Falls during June, 1926, by Mr. J. H. Power.

In the shortness of the limbs and the pattern of the ventral surfaces, this species agrees with *X. gilli* Rose and Hewitt, from the Cape Flats, and differs from *laccis* Daud.: in the length of the subocular tubercle, it agrees with *laccis*, but differs from *gilli* and the Mozambique species *muelleri* Peters. It is best regarded as a connecting link between *gilli* and the Congo species *tropicalis*.

Head narrow and flattened, snout obtuse, subocular tubercle projecting, but less than half the diameter of the eye in length: cuticle smooth throughout, except for some very fine granulation beneath the outer metatarsals and behind the tarsus, but only just visible to the naked eye: inner metatarsal tubercle rather small. Calcaneum only very slightly longer than the fourth metatarsal. Upper jaw estimated to have about 34 teeth on each side (several gaps, apparently indicating teeth lost in the individual), and a distinct interval between the two series. No vomerine teeth. Pectoral girdle of the arciferous type in the hinder half of the girdle, but the true left side very slightly overlapping somewhat as in *muelleri*.

Ventral surfaces with numerous dark blotches of irregular shape and size, more sparingly distributed under the thighs, more or less fusing into a network on the breast, altogether lacking on the throat: dorsal surfaces of head and body with several elongated dark blotches, but these are not very symmetrically arranged, one of them crossing the middle of the back obliquely,

and two others of irregular shape forming dorsolateral bands or patches, narrowing in front and broadest behind about the middle of the back.

Hind-limb being carried forwards, the tarsometatarsal articulation extends to about the middle of the eye.

Total length 65 mm., breadth at gape 18, length of hind-limb 76, of calcaneum 12.5, of fourth metatarsal 11.6.

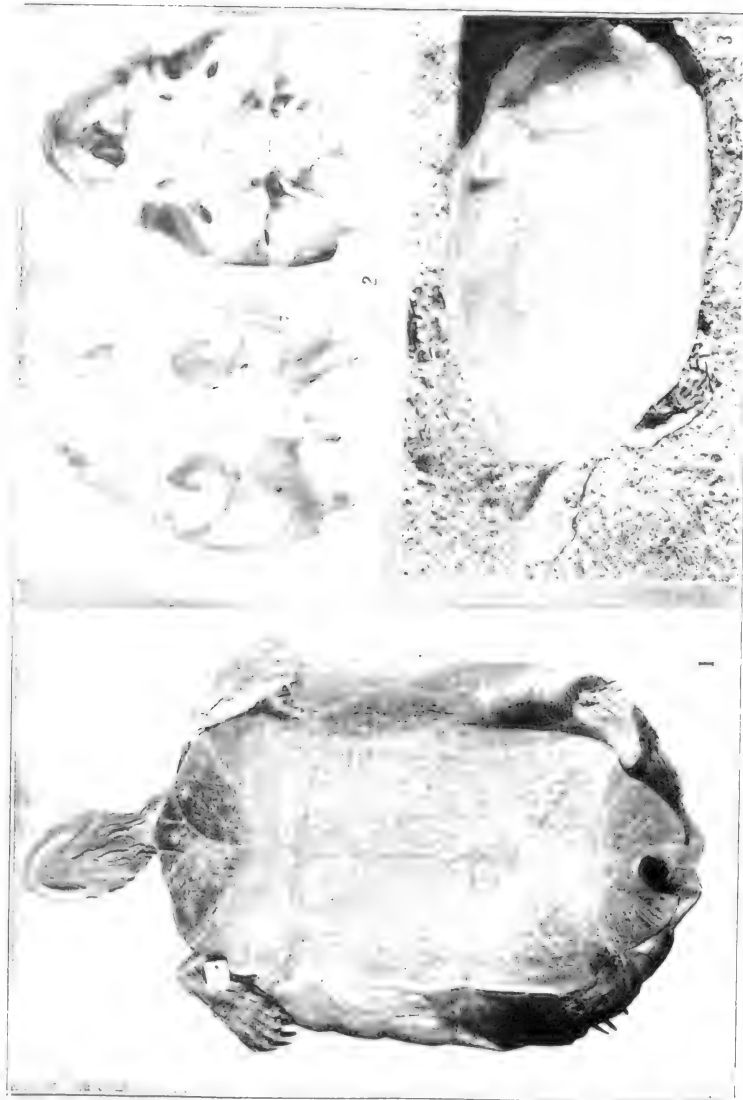
It is probable that some of the characters of the pectoral girdle will prove to be of specific importance in this genus. Generally, the posterior epicoracoids are distinctly overlapping as described by Prof. C. de Villiers (Annals Transvaal Mus. X, p. 205, 1924) but in one species at least, *tropicalis*, they are firmly united mesially and are moreover quite continuous with the sternal cartilage: in some species such as *laevis*, as known to me from Capetown, Victoria West, Fort Brown and Johannesburg, the right side of the girdle overlaps, but in other species, or subspecies, apparently the left side more normally—*muelleri* and more eastern forms of *laevis*—but the degree of constancy of either condition is not known to me. I have recently ascertained that in *gilli* of Capetown, overlapping may occur on either side: thus my previous statement that *gilli* is firmisternous like its ally *tropicalis*, as contained in the original description of the species (Trans. Roy. Soc. S. Af., vol XIV, 1927), is a regrettable error.

EXPLANATION OF PLATES.

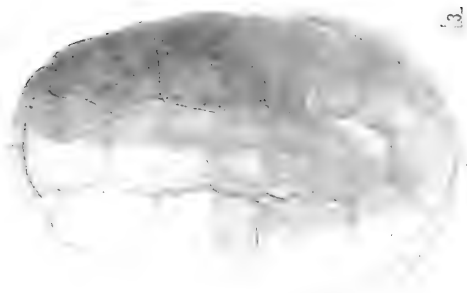
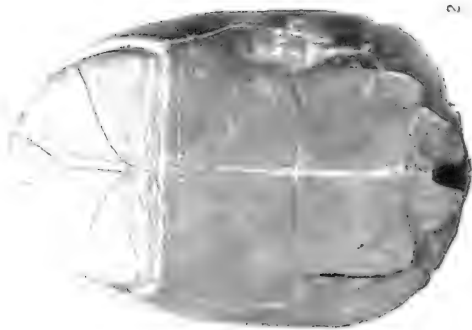
Pl. XX. *Pelusios sinuatus zuluensis* subsp. nov., figs. 1 and 3 type specimen from Umsinene River; fig. 2 skulls of paratypes.

Pl. XXI. Fig. 1. *Pelusios sinuatus* Smith (var.?) from Koe-doespoort, near Pretoria.

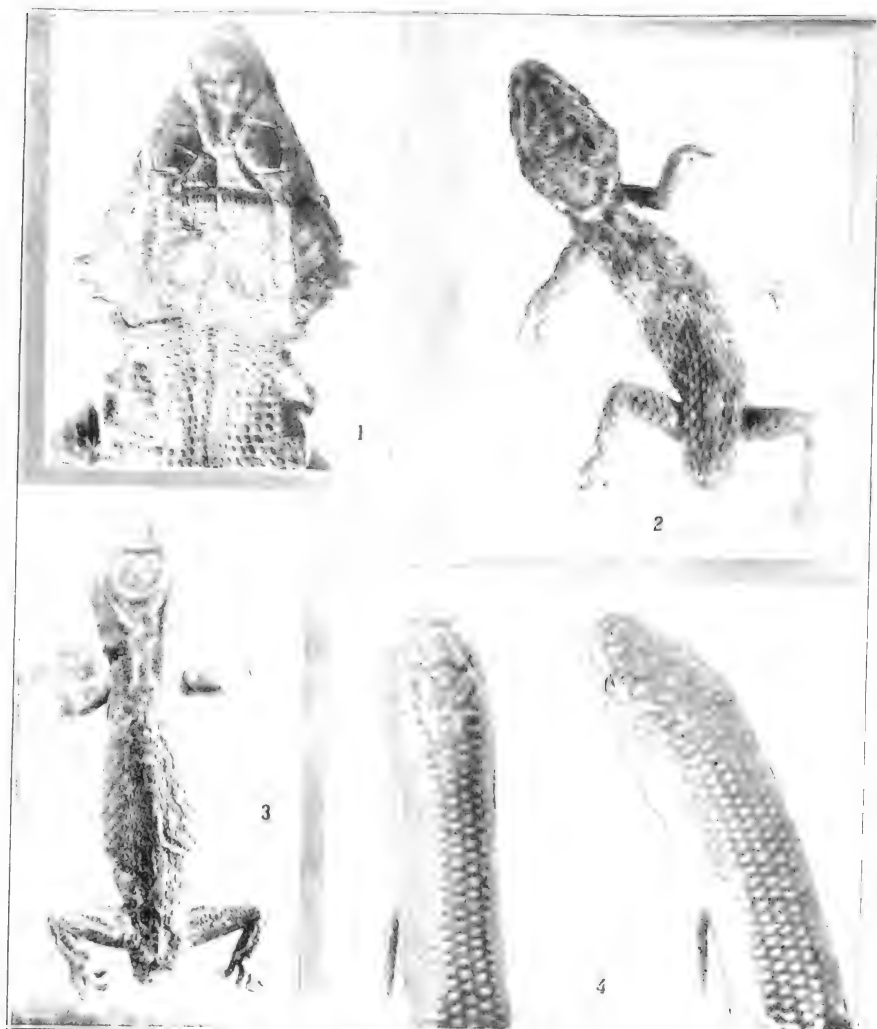
Figs 2 and 3. *Pelusios nigricans rhodesianus* subsp. nov. Type from Mpika District. Note that the anterior lobe of the plastron is foreshortened owing to bending at the hinge.



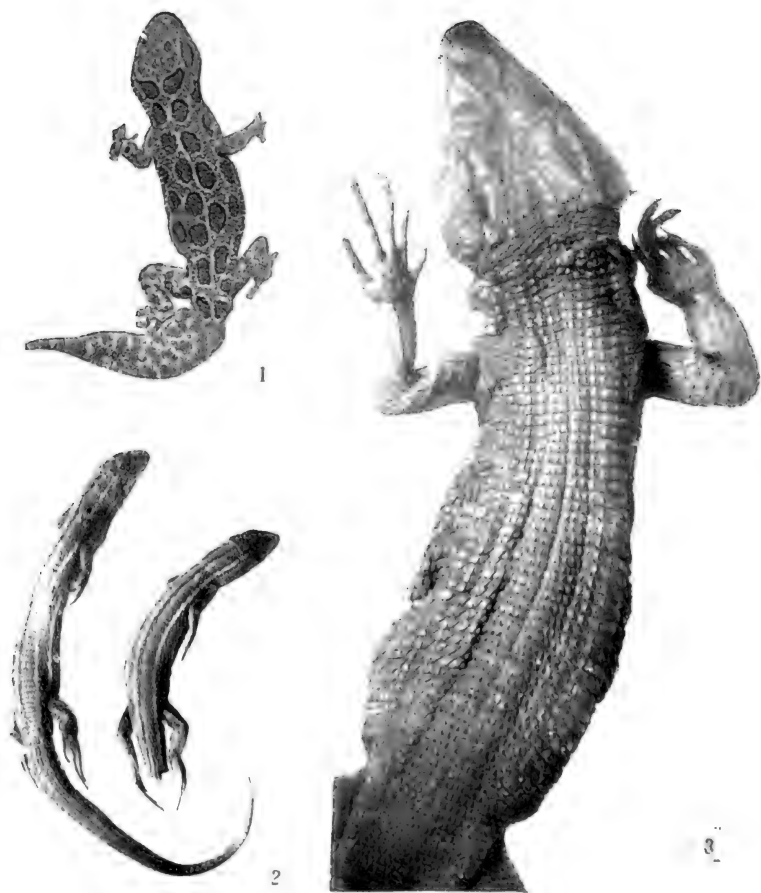
Pelusios sinuatus zuluensis subsp. nov. From Umsinene Riv.



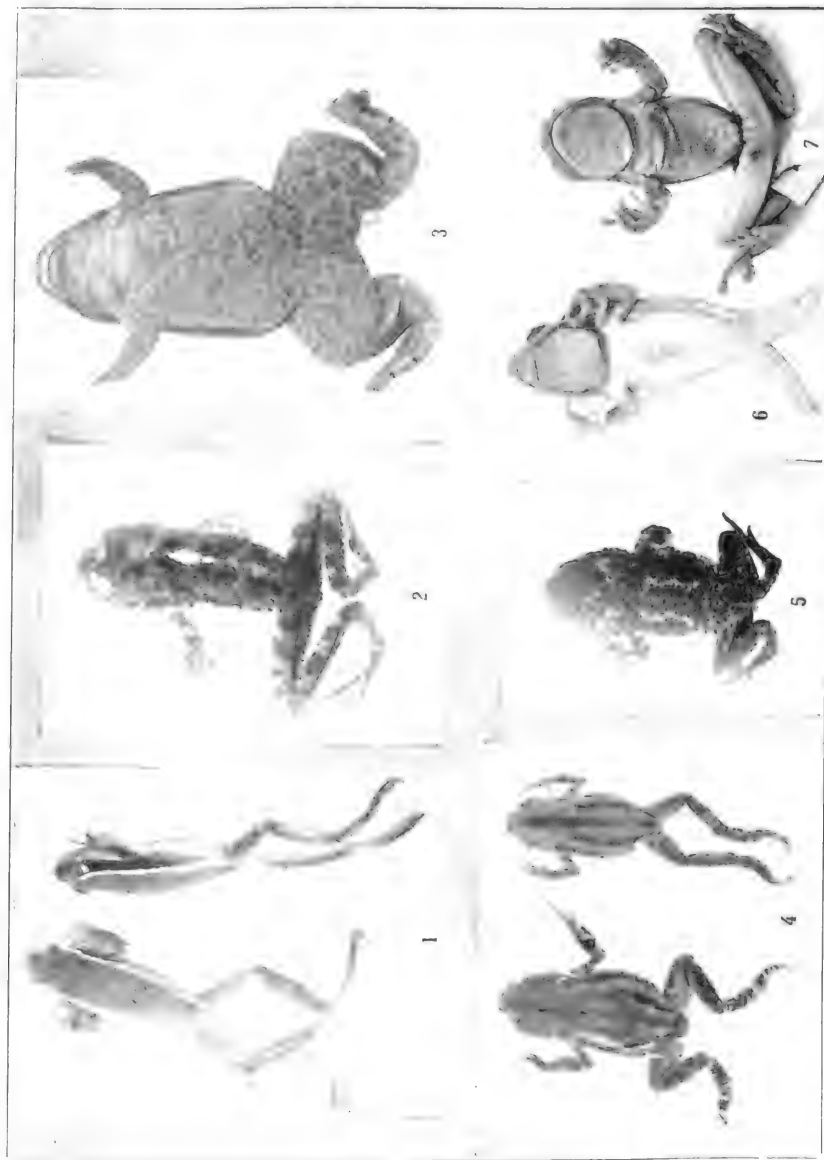
1. *Pelusios sinuatus* Smith var. From Koedoespoort.
- 2 and 3. *P. nigricans rhodesianus* subsp. nov. From Mpika Dist.



1. *Pseudocordylus microlepidotus namaquensis* subsp. nov.
2. *Pachydactylus scutatus* sp. nov.
3. *P. montanus* M. and H.
4. *Sepsina hessei* sp. nov.



1. *Pachydactylus maculatus oculatus* subsp. nov.
2. *Tropidosaura essexi* sp. nov.
3. *Pseudocordylus microlepidotus* Cuv.



- 1 and 2. *Hyalobates horslockii* Schl.
 3. *Rana vertebralis* sp. nov.
 4. *Kassina wealii quinquedactylata* subsp. nov.
 5. *H. horslockii semidiscus* subsp. nov.
 6. *Xenopus poweri* sp. nov.
 7. *Bufo gariepensis nubicola* subsp. nov.

- Pl. XXII. Fig. 1. *Pachydactylus capensis oculatus* subsp. nov.
Type specimen from near Tarkastad, enlarged.
- Fig. 2. *Tropidosaura essexi* sp. nov. Two co-types from summit of Mont-aux-Sources.
- Fig. 3. *Pseudocordylus microlepidotus* Cuv. Typical form from Capetown.
- Pl. XXIII. Fig. 1. *Pseudocordylus microlepidotus namaquensis* subsp. nov. Head of type specimen from Namaqualand.
- Fig. 2. *Pachydactylus scutatus* sp. nov. Type from Kowaris, S.W.A., enlarged.
- Fig. 3. *Pachydactylus montanus* Meth. and Hwtt. Type from Karasberg, enlarged.
- Fig. 4. *Sepsina hessei* sp. nov. Type from Kaoko Otavi. Enlarged nearly four times.
- Pl. XXIV. Fig. 1. *Hyperolius horstockii* Schl. Typical specimens from Capetown.
- Fig. 2. *Rana vertebralis* sp. nov. Type from Mont-aux-Sources.
- Fig. 3. *Xenopus poweri* sp. nov. Type from Victoria Falls: ventral view.
- Fig. 4. *Kassina wealii quinquevittata* subsp. nov. Type and young from Capetown.
- Fig. 5. *Bufo gariensis nubicola* subsp. nov. Type from Mont-aux-Sources.
- Fig. 6. *Hyperolius horstockii* Schl. Ventral surface typical specimen from Capetown.
- Fig. 7. *Hyperolius horstockii semidiscus* subsp. nov. Ventral surface of type from Mariannhill.

On some new Arachnids from South Africa

BY JOHN HEWITT.

[Plate XXV.]

ORDER SCORPIONES.

UROPLECTES FORMOSUS SPENCERI Poc.

There are specimens of this form in our collection from the following localities:—

Humansdorp (Dr. H. M. Brown), Enon and Zuurberg (J. Hewitt),

Port Elizabeth (F. Cruden), Grahamstown (various coll.), Resolution near Fort Brown (Miss A. Walton), Port Alfred (J. Hewitt), Pirie (R. Godfrey), East London (G. Rattray), Hogsback, Amatola Range (G. Rattray), Kei Road (G. A. Ranger), Mqanduli (Miss A. Pegler), Kei Bridge (H. Kumm), and a female example from Coetzee's Berg near Pearston (B. Marais).

U. spenceri, best regarded as a colour variety of *formosus*, is not altogether constant in the colour characters, specimens from forest districts at Hogsback and Pirie being considerably infuscated.

There is, however, a distinct form in Basutoland which may be known as: *Uroplectes formosus basuticus* subsp. nov.

Types: an adult male and two females collected on the Putsua Range near Rebaneng Pass by Mr. J. A. Cottrell during January, 1926.

This form differs from *spenceri* in the more slender build of its tail and palps: the fifth caudal segment of the adult male has its superior crest forming a low even curve: whereas in the male of *spenceri* the upper outline of the fifth caudal segment in side-view is strongly raised in advance of the middle point, tending to become subtriangular.

Further, in *basuticus* the length of that segment is about $1\frac{4}{5}$ times the height, but in *spenceri* only $1\frac{1}{2}$ times the height. Superior crest of fifth caudal segment in male of *basuticus* well developed posteriorly, being composed of a continuous series of 4 or 5 granules: elsewhere the crest is obsolete: in females those granules are present but rather ill developed and not in continuous series. Tubercle below aculeus small and inconspicuous in male, a little stronger in females. End teeth of superior crests in caudal segments II-IV of male enlarged much as in *spenceri*. The mesial surfaces superiorly of caudal segments not so deeply channelled as in *spenceri*: this is particularly noticeable in I and V.

The surfaces generally are infuscated: no median flavous band on the tergites, but more or less distinct indications of lateral V-shaped yellow markings occur on the 3 penultimate tergites: appendages with slight and indefinite infuscation: tail more strongly infuscated, but no segment of the tail is wholly blackened. Last sternite slightly infuscated. Vesicle with yellow lines well marked.

Pectinal teeth of male 16-17, the basal tooth a little broadened: of female same number, the basal tooth more strongly enlarged.

Total length M. 28 mm., F. 30: length fifth caudal segment M. 3.8, height of same 2, breadth of same 1.9: length of fifth caudal segment F. 3.9, height of same 2, breadth of same 2.1.

Although this form is certainly not separable from *formosus* as a species, yet it approaches definitely towards the allied species of the Western Cape, *lineatus*, etc., especially in the general slenderness of the tail and palps, and in the form of the fifth caudal segment, with a distinct though short superior crest.

UROPLECTES MACULIPES Hwtt. (Trans. Roy. Soc. S. Afr. VI,
p. 120, 1918).

This species, hitherto only known from male examples and regarded as a subspecies of *formosus* now seems well worthy of specific recognition. The Natal Museum has an adult female example from St. Lucia, Zululand (H. W. Bell Marley): the

species is also known from Ubombo (Bell Marley) and from Ntambanana (H. F. J. George).

The female differs from that of *formosus* as follows: in colouration, the middle flavous band being divided by a thin blackish mesial stripe and the lateral flavous band being much broader than in *formosus* where it is narrower than the dark lateral band, also each femur and patella of the legs is yellow, crossed in the middle by a dark band: tail more slender and only one segment, the third, has an enlarged end tooth superiorly: on the movable finger, a trio of teeth is only distinguishable in the several most distal rows of the finger, not as in *formosus* in all rows of the distal half of the finger.

OPISTHOPHTHALMUS CARINATUS Ptrs.

On the characters of the adult male, two well marked subspecies are recognisable.

The original description is inaccessible to me and almost certainly too incomplete for modern purposes, but I infer from Kraepelin's monograph (Jahrb. Hamburg Wiss. Anst. XI, p. 85, 1894) that the type came from the neighbourhood of Tette. We may therefore regard the Mashonaland form as typical. The distinctive characters of an adult male from Umfuli River, Mashonaland, have been briefly described by Pocock (Ann. Mag. Nat. Hist. 6, XVII, p. 237).

The following notes are based on a series of six adult males and two females collected at Wankie during January, 1926, by Capt. R. H. R. Stevenson:—Sternites of adult male (Pl. XXV, fig. 2) all more or less corrugate with transverse grooves, the first sternite only faintly so, the last very strongly so, sternites II-IV markedly corrugate and likewise also the under surface of the first caudal segment, whilst caudal segment II may show indication of such corrugation mesially. Tergites all minutely shagreened. Pectinal teeth M. 21-24; F. 16-17. Pocock's male from Umfuli River has 23 pectinal teeth.

Females closely resembling those of the form found so abundantly in and around the Kalahari.

Measurements: Total length M. 87, F. 89: length of tail M. 50.5, F. 45.5: length of carapace M. 13.2, F. 14.5: breadth of hand M. 9.5, F. 12: length of hand M. 23, F. 23.

A few juvenile specimens suspected to belong to this subspecies were collected also in the Sanyati Valley, South Rhodesia, by Captain Stevenson.

O. CARINATUS HISTRIO Thor.

The other subspecies is that described in my survey of the scorpion fauna of South Africa (Trans. Roy. Soc. S. Af. VI, p. 131, 1918) as *carinatus*. The sternites of the adult male are all smooth or nearly so: the last sternite only may be a little corrugated. The pectinal teeth are 24-32, the data of actual specimens being:—Kimberley 29, 26, 26-29: Kuruman 28: Bloemfontein (juv.) 26-29: N.W. Gordonia 25-26, 26-29: Mt. Temple, Bechuanaland 24: Grootfontein S.W.A.P. (juv.) 23-25: Daniels Kuil 24-27: Fleshfontein, N. Transvaal (juv.) 24: Williston (very large spec.) 26-27. This variety is very common at Kimberley where it lives on the kopjes under stones. It seems to range throughout the western half of Southern Africa as far south as Williston. Three other specific names have been applied to this variety, viz.: *anderssoni* Thor. (1877) based on a female from 'Africa meridionalis'; *histrion* Thor. (1877) based on a very young male from 'Caffraria,' and *furcatus* Sim. (1887) based on an adult male collected somewhere in the western half of Southern Africa.

The second name should be adopted because the number of pectinal teeth specified by Thorell, circa 28, seem to point quite clearly to the western subspecies.

OPISTHOPHTHALMUS AUSTERUS MONTICOLA subsp. nov.

[Pl. XXV, fig. 1.]

Type: a single adult female example taken on the summit of Mont-aux-Sources (11,500 ft.) by Mr. Robert Essex during January, 1926. Male unknown.

It is a very small and slender form with considerable resemblance to *O. austeroides* mihi, but the tail of *monticola* agrees

better with *austerus*, except in size: *austeroides* has a stoutish tail, and each of caudal segments I-III has a pair of cushion-like prominences on the upper surface, whereas in *monticola* and other forms of *austerus* the tail is more slender and only segment I is cushioned, the upper surfaces of II and III being more or less concave throughout.

The characters are:—Carapace depressed, only very finely granular at the sides: chelicerae with stridulatory lamellae: tail with well developed crests, the middle lateral crest of V being noticeably stronger than usual although occurring only in the first third of the segment: terminal teeth of superior crests in caudal segments III and IV subspiniform: hand depressed above but not very strongly, finger-keel almost unbroken, no other keel present, hand-back closely granular, upper surface of hand finely subgranular throughout: humerus with upper crests very weak and not granular, postero-inferior crest not granular: brachium with upper and anterior surfaces not quite so sharply separated as in typical form, the upper surface being more rounded and not noticeably flattened: genital operculum $1\frac{3}{5}$ times as broad as long: pectinal teeth 15-16.

General colour light brown, humerus, brachium and fingers olive, tail tinged with olive at the sides.

Total length 54 mm., of tail 25.5, of carapace 8, breadth of carapace 8, length of humerus 5.9, of brachium 5.9, of hand-back 5.4, of movable finger 7, breadth of hand 5.4.

This small form, when the male is known, will probably prove to be another link in the chain connecting *austerus* and *latimanus*. The latter species is known to me from many localities ranging from sea level to the top of the Great Winterberg mountain: a small female specimen with 11-12 pectinal teeth and total length 48 mm. has been taken in the last mentioned locality by Mr. R. Essex.

In addition, Mr. Essex collected two specimens of a form of *Opisthacanthus validus* at high elevations on the Natal side of the Mont-aux-Sources (circa 8,000 ft.). This form resembles *fulvipes* Poc. but is considerably stouter and much darker, the

legs being blackish; also, the hands are more coarsely sculptured and the surfaces generally are rather more hairy.

ORDER ARANEAE.

STASIMOPUS UMTATICUS RANGERI subsp. nov.

Type: an adult male collected on the farm Gleniffer near Kei Road Station by Mr. Gordon Ranger who presented it to the Albany Museum.

This agrees in many respects with the males from East London which I described as *spinipes* (Annals Natal Museum, vol. III, p. 692. Pl. XLVII, figs. 3 and 4, 1917) but differs as follows:—Size much smaller: tibia I not heavily spined at the sides and inferiorly as in *spinipes* for, apart from the apical spines, having only a pair inferiorly near to the apex and 3 or 4 unpaired spines in the basal half of the segment, whilst on the anterior surface there are but 2 short spines near the apex, and posteriorly 3 near the apex: metatarsus I with numerous strong but rather short spines on each side but with no spines whatever along the midline, tarsus I with 8 spines anteriorly and about 12 posteriorly: tibia II weakly spined, having either no spines on the mesial area inferiorly or only 2 in the apical half of the segment, in addition to which there is an infero-anterior row of about 5-6 spines and an infero-posterior row of about 6-8 spines which includes the apical spines (in *spinipes* the lower and lateral surfaces are thickly spined).

The female closely resembles that of *spinipes*, and according to the characters of my key (Records Albany Mus. III, p. 84) is also near to *umtaticus* Purc., a species I have not seen and of which only the female is known.

There is a slight difference of shape in the carapaces of *spinipes* and *rangeri*, the former being rather more compressed from side to side: moreover, the chitinisation of the anterior margin is different, the mesial portion being carried forwards in A-fashion in *spinipes*, but not in *rangeri* which has a straight anterior margin.

Colour of male, black throughout, except tarsi and metatarsi of legs which are reddish: of female, carapace and appendages castaneous the two anterior pairs of legs and palps darker.

Measurements: total length M. 11.8, F. 23; length of carapace M. 5.5, F. 11.3: breadth of carapace M. 5, F. 10: length of palp M. 12.2: length of first leg M. 19: length of fourth leg, M. 20.2: breadth of ocular area, F. 3.5.

Spinipes is to be regarded as a temporary name or of merely subspecific importance for, as was suggested in the original description, it is quite possible that the East London species will have to be referred to either *umtaticus*, *kentanicus* or even *kolbei*, when adult males of these three supposed species become known. Males from Kentani were afterwards described by Mr. R. W. E. Tucker (Annals S. Afr. Mus. XVII, p. 85) as *kentanicus* Purc.: these are evidently very like the East London types of *spinipes*, but it is still uncertain, I think, whether *kentanicus* is really distinct from *umtaticus* which has page precedence. Lastly the form *qumbu mihi* may also have to rank as a subspecies of *umtaticus*: the male is well distinct however from *spinipes* or *rangeri*, being spined over the inferior surface of metatarsus I as well as laterally.

STASIMOPUS FORDI sp. nov.

Type: a single adult male example collected at Masite, Basutoland, by Mr. Edward Ford who presented it to the Albany Museum. The species may possibly prove to be identical with one of the Free State species known only from female specimens: yet it differs from all males known from that region in the more moderate length of the palp. According to my key to the males of this genus (Annals Natal Museum III, p. 696, 1917), *fordi* may be placed near to *astutus* Poc. or *patersonae* mihi, but is at once distinguished therefrom by the absence of scopulae on tarsus IV, and by the sparsity of long hairs on the carapace, abdomen and appendages. In the two latter species, these long hairs are very conspicuous over the midocular region and along the 3 raised lines of the carapace, also over the upper surface

of the abdomen and on the distal segments of the appendages. Further, the carapace in *fordi* is depressed but compressed in the other two species. The description is as follows:—

Colour: blackish throughout except distal portions of legs and palps which are paler.

Carapace. Surface not glossy, minutely roughened over the hinder half and at the sides; cephalic portion only slightly raised, its surface not roughened except slightly over the three flattened keels. The median keel is traceable to the fovea: lateral keels short. A few short hairs behind the anterior median eyes. Anterior margins of anterior row of eyes in a very slightly procurved line, all moderately large, subequally spaced and rather close together, the distance between median and lateral approximately equal to half the diameter of the median. Length of carapace only very slightly exceeding the breadth.

Pedipalp: pressed forwards, the tip reaches a point about $\frac{1}{1.6}$ of the distance along the metatarsus of first leg: patella very slightly longer than patella I, very much shorter than tibia I. Legs. Tarsi I-III scopulate inferiorly, IV not scopulate. A few scopular hairs near the apices of metatarsi I and II inferiorly, but none on III and IV. Tarsus I without spines, II with 1 or 2 very weak short spines on both sides or on one side only, III with 1 very weak spine near the apex anteriorly and 3-5 on the posterior surface, IV with about 5 or 6 on the interior surface and two posteriorly near the apex. Metatarsus I without spines along the mesial surface inferiorly, but the sides are well spined—7-10 anteriorly, and about 11 posteriorly. Tibia I as long as metatarsus I, with about 12 spines on the lower surfaces excluding those at the apex: tibia III anteriorly with 4 or 5 short spines on or near the distal edge superiorly and 3 long ones more inferiorly, on the posterior side with 6-8 spinules above distally and several long spines below. Patella I with 3 spines at the apex inferiorly, also 1 or 2 on the anterior side distally: III with a strip of about 6 or 8 weak spinules along the anterior side but no distal patch of spinules above: IV with a basal patch of minute spinules anteriorly extending over nearly $\frac{2}{3}$ of the length of the anterior side.

Paired tarsal claws of fourth leg with a basal comb of only 2 or 3 teeth.

Measurements: total length 12.5 mm.; length of carapace 4.7; breadth of carapace 4.4; length of tibia of palp 3.5; of patella of palp 2.25; of metatarsus I 3.7; of tibia I 3.6; of patella I 2.2; of metatarsus IV 4.8.

STASIMOPUS SPINOSUS Hewitt (Records Albany Museum,
vol. III, p. 26, 1914).

This species, described as a variety of *schonlandi* and undoubtedly related thereto, has hitherto been known only from female specimens collected at Middle Drift, and at Debe Nek. Recently, Mr. C. W. Wilmot has found several adult female examples and one adult male at Alice, C.P. One female had 26 young ones in the nest: the adult male was found in the immediate vicinity of this nest.

The characters of the adult male are as follows:—resembling *schonlandi*, but smaller and darker, the distal segments of the appendages being infuscated and devoid of red tinge, and despite the name, being less strongly spinose, especially as regards the distal segments of the first leg.

Pressed forwards, the palp reaches a point about $\frac{1}{4}$ of the distance along metatarsus I: patella of palp only very slightly shorter than patella I. Tarsus I slightly swollen, with 3-4 weak spines anteriorly and likewise also posteriorly: tarsus II with 5 or 6 spines anteriorly and 6 posteriorly: tarsus IV with about 10 weak spines posteriorly and rather more anteriorly, the claws with well-developed basal comb of teeth. All tarsi scopulate. Metatarsus I and II without trace of scopula. Metatarsus I beset with long strong spines on its lower surfaces: about 12 or 13 occur anteriorly and 8-12 posteriorly but spines are absent along the mesial line except I proximally.

Tibia I slightly shorter than metatarsus I, armed with about 16 or 17 longish spines below, about 8 of which are apical. Patella I quite devoid of spines inferiorly.

Patch of spinules on anterior surface of patella IV extending over about $\frac{2}{3}$ the length of the segment.

Carapace without hairs on the head region. Carapace keels more or less as in *schonlandi* but eyes relatively larger, the diameter of the antero-median decidedly greater than the distance intervening between antero-median and antero-lateral.

Length of carapace 5.7, breadth of carapace 4.9, breadth of ocular area 2, length of first leg 18.5, length of fourth leg 21.

The lack of red colouration in the terminal segments of the legs also characterises the East London form *spinipes*, and probably many other species, but I have noticed that spirit-preserved specimens of *spinipes* show a red discolouration as conspicuous as that in living examples of *schonlandi*.

Apparently, *spinosus* has no close relationship with *spinipes* nor with any other form as yet known from the more eastern parts of the Cape Province, unless it be with *insculptus* of King William's Town which is at present only known from the type specimen.

On the evidence of female specimens another species of *Stasimopus* occurs at Alice, living alongside *spinosus*.

STASIMOPUS MARAISI Hwt. (Records Albany Mus. III,
p. 24, 1914).

Mr. Hubert James has recently sent an adult male from Victoria West. This is referred to *maraisi* on the locality data and because of the smallness of the posterior lateral eyes.

The more important characters are as follows:—pressed forwards, the palp reaches as far as the basal fifth of metatarsus I: patella of palp decidedly longer than patella I, but shorter than tibia I: tarsus I without spines: metatarsus I without scopular hairs at apex, and no spines along the median area inferiorly, but with 7 or 8 long spines along the anterior side and about 3 or 4 slender ones posteriorly: Tibia I a trifle shorter than metatarsus I. Tarsus II with a single small spine on the posterior side: IV scopulate except towards the base, and with about 10 setiform spines on the anterior side, a single one posteriorly, the paired claws with basal comb of only 3 teeth. Patella III anteriorly with about 6 short spines on the anterior side, but no distal patch of spinules above: IV with basal patch

of minute spinules anteriorly extending about half the length of the segment.

Carapace with a tuft of hairs over the ocular area: the 3 usual keels present, the median one which carries hairs, extending to the fovea. Anterior eyes all rather large, the median ones raised slightly as if on an incipient tubercle. Surface of carapace smooth and glossy over anterior half, slightly roughened over posterior half.

Length of carapace 5.4, breadth of carapace 4.6, of patella I 2.75, of metatarsus I 4.75, of tibia I 4.5, of patella of palp 3.4.

Apparently, this species is not as I first supposed a near ally of *palpiger* and *schreineri*. The male characters seem to point rather to relationship with the Free State species *nigellus* and *minor* (see Annals Natal Mus. III, p. 697, 1917).

ORDER SOLIFUGAE.

SOLPUGA DARLINGI Poc. Ann. Mag. Nat. Hist. 6, XX, p. 260, fig. 5.

The type came from Gadzima on the Umfuli River, Mashonaland, and we have the species from Wankie (R. H. R. Stevenson). Pocock's figure is perhaps incorrect as regards the relative sizes of the teeth: in the Wankie specimen (Pl. XXV, fig. 4) the first two teeth are each considerably larger than either the third or the fourth, the fourth being much larger than the third. On the inner side of the fang is a denticle near the upper edge, immediately above the first tooth. Upper surface of chelicera beset with numerous long spiniform bristles.

Two subspecies are known to me, viz.:

1. *S. darlingi kafulica* mihi. Annals Transvaal Museum VII, p. 73, 1919, described as a form of *niassa* Karsch.

This form only known from Kafulafuta, N. Rhodesia, has the flagellum very slightly longer than in *darlingi* but is chiefly distinguished therefrom through the complete absence of the third tooth in the adult male.

2. *S. darlingi centralis* subsp. nov. [Pl. XXV, fig. 3.]

This is based on a single adult male example from Sagayo, Mwanza, Tanganyika Territory, collected by Mr. A. Loveridge

(I.XI.22) who presented it to the Albany Museum. This specimen differs from those found south of the Zambesi in the slightly greater length of the flagellum. The middle point of the recurrent portion of the flagellum lies immediately above the highest point of the basal enlargement: distally the flagellum is gradually and finely tapering, and at the apex is minutely hooked. Hind border of basal enlargement not quite upright, being slightly but definitely curved. Two intermediate teeth in the upper jaw: a distinct denticle on the inner side of the fang superiorly. Upper surface of chelicera beset with setiform spines.

Total length 30 mm., length of immovable portion of chelicera to tip of fang 8.8, length of recurrent portion of flagellum 3. The typical form of *darlingi* is much bigger, the length of the chelicera being 11.75 in the Wankie specimen.

This subspecies is presumably the one to which specimens from Longido West, Mbunyi and Lumbo should also be referred (see A. Loveridge in P.Z.S. 1925, p. 308).

Lastly, I think it is probable that *schonlandi* Poc, a Cape-Transvaal species will prove to be connected up with *darlingi* by intermediates.

HEMIBLOSSIA MONOCERUS sp. nov. (Text fig.).

Type: a single adult male specimen collected at Redbank, S. Rhodesia, 6.9.1926, by Captain R. H. R. Stevenson, who presented it to the Albany Museum. It was taken on sandy soil in the forest sandstone.

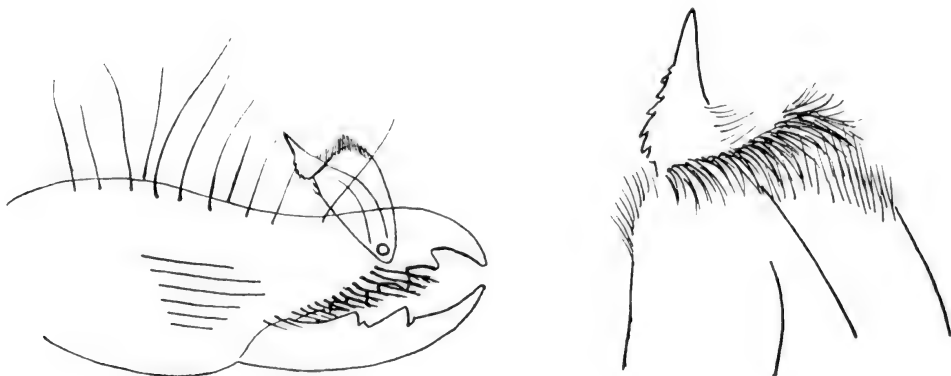
The species has considerable resemblance to *H. o'neili* Purc. and to *idioceras* Hwtt. but has a distinctive flagellum: the superior horn, which is quite large in the former species, is not present in *monocerus*: the inferior horn, which is short and blunt in *idioceras*, is long and acutely pointed in *monocerus*.

The flagellum consists essentially of a simple oval pouch of very delicate membrane, the pouch opening by a long wide slit along the mesial side, and ending in the aforementioned inferior horn where the membrane is stiffer. Dorsally, along the greater part of the length of the pouch, a thin transparent stiff membrane extends upwards as a high keel: this keel is

fringed with hairs distally on the mesial side: on the outer side, near the base of the inferior horn, there is a dense broad outstanding fringe of hairs crossing the membrane transversely to its axis.

The inferior horn has basally a small flattened membranous extension outwards, which extension has finely serrate margin, and together with the aforementioned external fringe helps in the formation of a shallow cup-like depression near the apex of the organ on its outer side. The flagellum of *Hemiblossia* is thus like that of several species of *Blossia*, but for the high keel and the distal fringe of hairs.

Stridulatory lamellae six, of which the three lower ones are shortest, the fourth and fifth from the base longest. Fourth tarsus faintly bisegmented, and carrying 6 lateral bristles, the distal 3 being closely approximated and the basal three widely separated: these are not conspicuous, being only a trifle stouter than the adjacent bristles. Modified hairs are found on the first and third post-genital sternites, but they are comparatively slender. The palps also are more slender and much less heavily clothed with cylinder-bristles than is the case in *o'neili*, where



Hemiblossia monocerus sp. nov. Left chelicera of male seen from mesial side: and distal portion of right flagellum more enlarged, outer side.



1. *Opisthophthalmus auslerus monticola* subsp. nov.
2. *O. carinatus* Pts., ♂
3. *Solpuga darlingi centralis* subsp. nov.
4. *S. darlingi* Poc.

they are outstanding and conspicuous. Total length 7 mm. Colour as in *o'neili* but rather darker, the legs and head plate being more or less infuscated.

Some years ago, the genus *Hemiblossia* was recorded from Central America, a record of considerable interest seeing that it is otherwise only known from South Africa. However, it is not at all certain that the American species was correctly referred to this genus. I have examined the type and only known specimen in the British Museum (*H. vittata* Poc. from Guatemala) and find on the form of the head-plate such identification is improbable. The head-plate of *vittata* is nearly circular in outline, but the anterior margin is markedly angular: in the female of *o'neili*, the head-plate is subpentagonal in outline, but is less angular anteriorly. There is a conspicuous median groove on the head-plate of *vittata*, less pronounced in *o'neili*. It is clear that the generic position of *vittata* must remain doubtful until the adult male is known.

EXPLANATION OF PLATE XXV.

- Fig. 1. *Opisthophthalmus austerus monticola* subsp. nov. Type specimen, female, from summit of Mont-aux-Sources.
- Fig. 2. *Opisthophthalmus carinatus* Ptrs. Portion of ventral surface of adult male from Wankie, enlarged.
- Fig. 3. *Solpuga darlingi centralis* subsp. nov. Type specimen, left chelicera of adult male from Tanganyika territory.
- Fig. 4. *Solpuga darlingi* Poc. Left chelicera of adult male from Wankie.

On several new Rodents in the Albany Museum.

By JOHN HEWITT.

(Plates XXVI and XXVII.)

OTOMYS ROBERTSI sp. nov. [Pl. XXVI, figs. 3 and 4.]

Type: a small female specimen, from the summit of the Mont-aux-Sources (11,500 ft.) collected by Mr. Robert Essex (Jan., 1926), and presented by him to the Albany Museum. The specific name is in recognition of the important work of Mr. Austin Roberts, our authority on South African mammals. It somewhat resembles *O. irroratus orestes* Thos. from the Upper Alpine Zone of Mount Kenya (13,000 ft.), but this has six lamellae on the third upper molar and the skull is peculiarly arched: another mountain form with somewhat similar skull characters is *O. i. denti* Thos. from Mt. Ruwenzori, which however has a much longer tail, and likewise *O. dollmani* Heller from Mt. Gargues.

Fur very dense; long and harsh hairs scarcely noticeable; dorsally brownish, darker than in similar-sized specimens of *irroratus* from Grahamstown, only faintly grizzled, snout tinged with golden brown, ears with almost golden yellow hairs, vibrissae conspicuously developed, mostly pale, upper surfaces of feet yellowish grey, tail yellowish grey with mesial black stripe above, the black disappearing near base of tail, flanks and belly buffy yellow.

Skull with nasals expanding gradually in front, not abruptly as in *irroratus*, and not so broadly expanded as in that species.

Inter-parietal broad but small, its antero-posterior diameter scarcely more than half the length of the coronal suture. Palatine foramina straight and parallel, not more or less laterally arched as in *irroratus*. Plate forming outer border of antorbital foramen with almost vertical anterior border only becoming rounded above—in *irroratus* usually more or less evenly curved

throughout: antorbital foramen rather large and open in front. Muzzle rather long, but braincase short and broad. Lachrymal bone small but projecting. External auditory meatus not produced, bullae of moderate size. Each upper incisor with two grooves, that near the inner edge quite faint and the groove on outer half comparatively weak: the teeth are directed more or less vertically downwards, not strongly backwards as in *irroratus*: lower incisors each with a single groove: both upper and lower teeth weaker than in *irroratus*. Third upper molar with 4 complete laminae, fifth lamina quite large but involuted behind, and thus more or less kidney-shaped, sixth represented on left side only as a small rounded rudiment adjoining the fold of the fifth. First lower molar with 4 complete laminae, the first small (on the left side the second is divided into two). All molars rather broad.

Measurements: head and body (estimated) 105 mm.; tail about 38; skull greatest length 34.2; basilar length 29; nasals 14.5×5.4 ; interorbital breadth 4.1; interparietal 8×3.1 ; diastema 9; palatine foramina 5.8; upper molar series, crowns only, 7.2; bulla length 7; width of upper incisors at tip 2.

The form just described is a very distinct one, combining the characters of the two species *irroratus* and *unisulcatus*, the molar characters being of essentially *irroratus* type, whilst the shape of the nasals, of the palatine foramina, of the antorbital plate, and the more vertical arrangements of the upper incisors are *unisulcatus* characters. The molar characters are however of greater taxonomic value, and it may be that *robertsi* should be regarded as an environmental form of *irroratus* or even vice versa.

In describing *orestes*, Mr. Thomas remarked: 'This is evidently a mountain race of the common East African Otomys, and it was quite to be expected that in the colder climate of what Dr. Gregory calls the "Upper Alpine Zone" of Kenya, the feet and tail should be shortened in accordance with the usual rule in such cases. It is however curious that as exemplified by four examples the Alpine form should have a lamina less in the last molar.'

It is an interesting fact that *orestes* of Mount Kenya and *robertsi* of Mont-aux-Sources agree together in the possession of a number of characters not found in *irroratus*, which has representatives at lower altitudes in both regions. These characters are: narrow nasals: short interparietal: reduction in number of laminae on last upper molar: shorter tail.

These facts might be explained in two ways:—either, *orestes* and *robertsi* are two isolated remnants of the original primitive *Otomys* stock, which has disappeared in the intervening and lower regions, perhaps through competition with a more advanced type, *irroratus*: or, the two high mountain species are nothing more than environmental forms of *irroratus*, the products of a colder climate. It may be that, on the distribution data alone, we shall never be able to interpret the facts entirely to our satisfaction, for it is indisputable that climate and food have a modifying effect on structure. At least one of the characters common to *robertsi*, *orestes*, *dollmani* and *denti*, the narrower nasals, may fairly be regarded as primitive; and it seems a significant fact that a character limited to high altitudes in the eastern parts of Africa should only be found elsewhere in the extreme south of the continent, being known in *unisulcatus* and *brantsi* which are Karroo species. Yet, the apparent primitiveness of *robertsi* may be quite secondary: there seems to be a direct correlation between size of incisor teeth and breadth of nasal bones: it is conceivable that, through some change in the nature of the food at high altitudes, the incisor teeth suffer reduction in size, and coupled therewith is a return to more simple type of nasals.

Lastly, attention is called to the most recent classification of this group of rats (Ann. Mag. Nat. Hist. 9, II, p. 204, 1918) in which Mr. Thomas refers them to three distinct genera. On this classification, which attaches primary importance to the nasal character, *robertsi* could not be included in *Otomys*: but, on the other hand, it would not fit in well with *Myotomys*, the genus which includes *unisulcatus*. I therefore venture to suggest that *Myotomys* cannot now be maintained as a distinct genus, for *robertsi* is a truly intermediate type.

I take this opportunity of recording a form of *unisulcatus* from Grahamstown. It is very common in the drier parts of the Albany district, occurring on farms adjoining the Grahamstown commonage on its north side and extending far into the Fish River valley. The Albany form is evidently near to *granti* Thos. from Deelfontein in the Hanover district, but differs as follows: no vinaceous tinge in the fur: tail shorter, about 90 mm. long: upper incisors with distinct groove, visible to the naked eye.

We have no specimens from the Hanover district, but spirit specimens in our collection from Grootfontein near Middelburg agree closely with Grahamstown material. According to Mr. R. C. Wroughton (Ann. Mag. Nat. Hist. 7, XVIII, p. 270), a specimen from 'Fish River' should be referred to *granti*: and Mr. A. Roberts informs me that the Transvaal Museum has that species from Cradock: this being the case, it is very probable that *granti*, with slight variations, is the only occupant of this group found in the Fish River valley from the Albany district northwards to the Middelburg district.

The true *unisulcatus* Cuv., as figured by Smith, differs greatly from the Albany form, having a much warmer colour and the ears noticeably larger. Unfortunately, the characters are very ill known and no exact locality is indicated for the type: the data given in Wroughton's key—east coast of South Africa—probably means some part of the region between George and the Albany district, the species being limited apparently to the dry Karroid regions of the Cape Province.

PRONOLAGUS RUDDI KARIEGAE subsp. nov. [Pl. XXVII,

figs. 5 and 6.]

Types: this subspecies is based on several specimens from Kariëga River, Bathurst district, taken May 21st, 1915.

The external characters seem to be very like those of typical *ruddi* Thos. and Schwann* from Sibudeni, Zululand, but the following minor points of difference occur: nape patch with decided buffy rufous tinge: front half of outer surface of ear

*Proc. Zool. Soc. Lond., 1905, I, p. 272, Pl. XVI, 4.

not edged with black on its upper third, although a little darker there: wool-hairs everywhere slaty grey basally, their tips dark brown on the back, but always with a short intervening zone of buffy: on the sides of the body, the wool hairs are pale buffy towards their tips and on the rump are rufous: tail rufous, the hairs with slaty bases: ear decidedly shorter (98 in type of *ruddi*).

In the skull characters, *kariégae* is distinguishable through the more slender muzzle: the nasal bones are a little longer and narrower: the choanae are narrower: anterior shoulder of zygoma-root weaker, and the arch less sinuous in dorsal view: anterior lower premolar with its anterior enamel wall crenulated, but not so strongly as in *ruddi*—according to Lyon† there are two deep simple reentrant angles in front in the species figured by him as *crassicaudatus* and afterwards referred to *ruddi* by Thomas, but in *kariégae* there is only a single deep reentrant angle which indeed is sometimes feebly developed: anterior upper premolar with the anterior enamel wall normally presenting two deep reentrant angles and a third rather shallow one, instead of three deep ones as figured by Lyon.

Measurements: Hindfoot 98, ear 80, skull greatest length 95, basilar length 75, zygomatic breadth 42.5, nasals 47.5×19.5 , interorbital breadth 16, intertemporal breadth 13.25, diastema 31.5, palatal foramina 27.5×9 , palatal bridge 10.5.

The nasals in another specimen are appreciably broader (46×21), but in no case quite so broad in proportion to the length as in typical *ruddi* (44×22). The narrow choanae seem to be a constant feature.

Kariégae is at present the most southern known form of its species.

PRONOLAGUS CRASSICAUDATUS SAUNDERSIAE subsp. nov.

[Pl. XXVI, fig. 2.]

This new race of rooihaas is based on skins and skulls from two localities in the Albany district—from farm “Hounslow,”

†Smithson Misc. Col., vol. XLV (1904), Pl. XCI, fig. 8.

collected by Miss E. Saunders, and from 'Mountain Top,' collected by Mr. Frank Bowker. I have pleasure in associating therewith the name of Miss Enid Saunders, M.Sc., whose recent studies have added much to our knowledge of the rodents of the district. It resembles *P. C. curryi* Thos. from Boshof, O.F.S. (Ann. Mag. Nat. Hist. 7, x, p. 245), but in general colour is much less rufous, and is at once distinguished therefrom in the colour of the wool hairs which in *curryi* are wholly rufous to their bases almost all over the body. In *saundersiae*, the wool hairs have slaty bases throughout head, body and tail, above and below: over the first half of the back these wool hairs show only a trace of rufous distally, are dark at the tip, and the bases are pale slate colour: but behind, near to the tail, the hairs become much longer and more deeply coloured, being slaty in the basal half and rufous in the distal half, the tips being blackish.

On the tail, the wool hairs are slaty only at their bases. Longer hairs of back black over the greater portion of their length, a little paler basally, and with conspicuous white annulus near the tip.

A rufous patch on the nape, and base of ear rufous posteriorly: anterior outer surface of ear finely grizzled dark grey: otherwise the ground colour of back is grizzled black and grey, the black being most noticeable over the hinder half of the back. Head greyish at the sides: a rufous tinge over the occiput and snout: nostrils with buffy or buffy red margins. Limbs buffy rufous throughout. Under surface of body buffy, centre not whitish, throat grey brown not buffy. Tail deep rufous and with many black hairs.

Length of hind foot 79, of ear 73 mm.

The skull measurements are as follows:—greatest length 80, basilar length 62.5, zygomatic breadth 35.7, length of zygomatic arch 28.2, nasals 36.3×17 (at middle 14.5), interorbital breadth 13.25, intertemporal breadth 11.7, height of orbit (to post-orbital process) 17, palatal foramina 23×9 , breadth of palatal bridge 6.8, antero-posterior diameter of bullae 9, diastema 25, breadth of upper incisors near tip 4.4.

A slightly larger female specimen has zygomatic breadth 36.5, palatal foramina 23.2×8 , upper incisors near tip 4.75, length of zygomatic arch 30, nasals 36×14 .

Apparently, the skull can be distinguished from that of *curryi* through the shorter nasals and narrower zygomatic breadth, these being given as 40 and 39 respectively for *curryi*.

The following notes were kindly given to me by Mr. Frank Bowker:—'The small red hare is never plentiful in these parts (Fish River Rand and Bush). It is solitary in habit and is generally to be found near some rocky spot where it can run into crevices and holes among the stones when chased by dogs. About that spot it remains indefinitely, and there is always a place for the dung deposits. It is not very fleet of foot but is very quick in dodging and evading dogs, particularly among stones and scrub. During the drought of the year 1919, one of these hares lived in an American Aloe patch near my house and used to come out to feed in the evenings about half an hour before sunset. There were no suitable stones to hide in anywhere near that spot. Apparently, the rooihaas sleeps during the day, for except when disturbed, I have only seen it during early morning and evening. One of my neighbours tells me that he once found two young ones in a neatly formed nest at the base of a hollow tree: the nest had a good deal of fur from the mother in it.'

Another form is known to us from Rooispruit near Rosmead (coll. A. Gibbons and R. H. T. Drake). It agrees fairly well with *saundersiae* in skull characters, but is more rufous. All the wool hairs on the back have rufous bases, but on the lower surfaces the bases are all slaty: on the other hand, the base of the ear posteriorly is not so rufous but more greyish. It will probably prove to be more or less intermediate between *curryi* and *saundersiae*.

According to Thomas and Schwann, *crassicaudatus* in its different subspecies is spread all over southern Africa from Nyassaland in the north and Namaqualand on the west to Wakkerstroom and Natal on the south-east. They have recorded the species from the Woodbush, but apart from this record and that

of the type I can find no evidence of its occurrence in the eastern districts of this subcontinent. It seems to be essentially a central and western species. I think therefore that the locality record, Natal, of the type is erroneous: or, otherwise, the type may even be the young of *ruddi* for its skull characters have not been investigated apparently.

PRONOLAGUS CRASSICAUDATUS BOWKERI subsp. nov.

[Pl. XXVI, fig. 1, and Pl. XXVII, fig. 7.]

Still another form, but more sharply separated from either *curryi* or *saundersiae*, is known to us through a single adult skull from Gaika's Kop, Amatola mountains. I have named it after Mr. Frank Bowker who collected it and who first recognised this as an undescribed form. The specimen is in the 'Frank Bowker' collection of skulls in the Albany Museum.

This skull is considerably longer than any hitherto recorded for *crassicaudatus*, and the nasal bones are long and unusually narrow. Measurements are as follows:—Greatest length 90; basilar length 69; zygomatic breadth 39; length of zygomatic arch 35.3; nasals 42×18 (behind), 14 (in middle), 10.2 (in front); interorbital breadth 16.4; height of orbit (to post-orbital process) 19.8; intertemporal breadth 11.3; palatal foramina 26.2×9.5 ; breadth of palatal bridge 7.2; antero-posterior diameter of bullae 9; diastema 28.8; breadth of upper incisors near tip 6.

The bullae are relatively small, but not so small as in *ruddi* and the paroccipital processes do not surpass them: two prominent processes on the surface of the bulla posteriorly (these are weaker in *curryi* and *saundersiae*). The anterior shoulder of zygoma is large. Dental characters much as described by Thomas for *crassicaudatus* (P.Z.S. 1905, p. 274): the anterior lower premolar with its anterior enamel wall having a single but rather deep notch, as is also the case in *saundersiae*.

Anterior angle of postorbital process well developed, unlike *ruddi* where it is obsolete or lacking altogether.

The skull of a young male from Gaika's Kop (collected

Sept., 1926, F. Bowker) is much shorter, in total length approximating that of the Albany form, *saundersiae*. But, there are various points of difference from that form:—in young of *bowkeri*, the zygomatic arch is decidedly longer, the jugal being carried backwards beyond the squamosal to a greater extent than in *saundersiae*: orbit distinctly larger, its depth considerably exceeding the breadth of nasals basally (these two measurements subequal, or nearly so, in *saundersiae*): anterior angle of postorbital process weak, and very obtuse, and thus more like that of *ruddi* than typical *crassicaudatus*: the square shield on the occiput formed by the lambdoid crest is narrower than in the type *saundersiae* (10.2 : 11.8) and the whole snout is weaker, the nasals a little narrower and less strongly arched in front, but these characters are subject to variation in *saundersiae*: paroccipital process slightly surpassing the bulla, which is not quite so swollen as in the Albany form.

This skull also differs markedly from the type in the form of the nasals. In the young male these bones are rather depressed in front: in the type they are strongly arched from side to side, and much longer.

The principal measurements of this skull are: greatest length 79, basilar length 60.5, zygomatic breadth 38.7, length of zygomatic arch 32.5, nasals 36.2×15.75 , interorbital breadth 13.25, intertemporal breadth 12.3, height of orbit (to postorbital process) 18.9, palatal foramina 21.7×7.75 , breadth of palatal bridge 7.2, antero-posterior diameter of bullae 9, diastema 24.7, breadth of upper incisors near tip 4.9.

The skin characters of the same individual are as follows:—decidedly lighter in colour than the Albany form, the black on the back and tail being feebly developed and the rufous tints much weaker: a pale rufous tinge over the occiput, snout buffy, nostrils with buffy-yellow margins, nape patch and base of ear posteriorly pale rufous, anterior outer surface of ear buffy: back grizzled buffy-grey and black, but the black nowhere predominates, tail light rufous with only few black hairs so that to the naked eye the rufous colour seems to be unmixed with black, sides of body buffy-grey: wool hairs with dark slaty bases

throughout, above and below: over the fore part of the back the slaty colour is much darker than in *saundersiae*. The fur is soft as in other forms of *crassicaudatus* but the hairs are unusually long: over the shoulders, the slaty zone has a depth of about 12.5 mm. Length of hind foot (with claw) 74 mm., of ear 75 mm.

Bowker's rooihaas is evidently a well marked form, easily distinguished from all others by its large size. It is also more dolichocephalic, has a smaller tympanic bulla and rather larger eye than in the forms found in the karroid country near Grahamstown at much lower elevation, and near Rosmead on the elevated plateau. In these respects, *bowkeri* approaches *ruddi*, a more eastern form which apparently does not extend into the Karroo. Although now placed under *crassicaudatus*, it may eventually rank as a perfectly distinct species when sufficient material is available for study purposes.

It may be noted that karroid and sand-veld mammals, especially those of burrowing habit, often differ from their allies of other regions in their brachycephalic skulls and enlarged bullae, whilst certain burrowers suffer reduction of the eyes. (For an interesting account of sandveld rodents in S. Africa see A. Roberts in S.A. Journal of Natural History, Sept., 1923.) It seems doubtful, however, if the structural differences between these hares are in any way connected with different burrowing habits.

The following notes on Bowker's Red Hare were given to me by Mr. Frank Bowker:—"These hares are larger than the small red hares of the Fish River Valley. They live on various high mountains near Gaika's Kop, for I have seen specimens apparently much like the type on the Elandsberg and Scurveberg mountains. They are not very plentiful, and owing to the abundant cover afforded by stones are not easily met with. They are very quick and active among the stones and on the steep mountain slopes. They lie up during daytime and come out to feed in the early morning and evening. Though apparently solitary in habits, I think it likely that they resort together in pairs. Like other red hares, they deposit the dung in one spot."

EXPLANATION OF PLATES.

Pl. XXVI. Fig. 1. *Pronolagus crassicaudatus bowkeri* subsp.
nov. Slightly reduced.

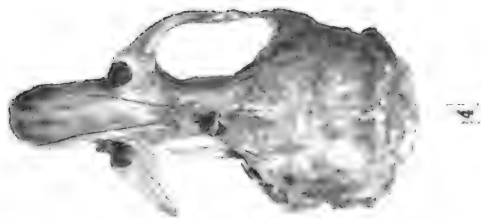
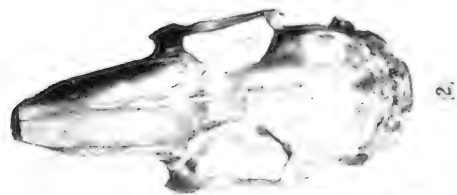
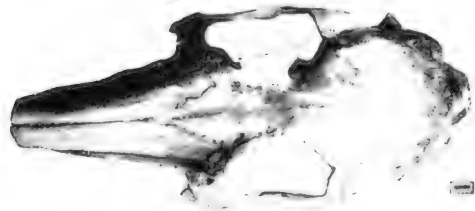
Fig. 2. *Pronolagus crassicaudatus saundersiae*
subsp. nov. Slightly reduced.

Figs. 3 and 4. *Otomys robertsi* sp. nov. $\times 2$.

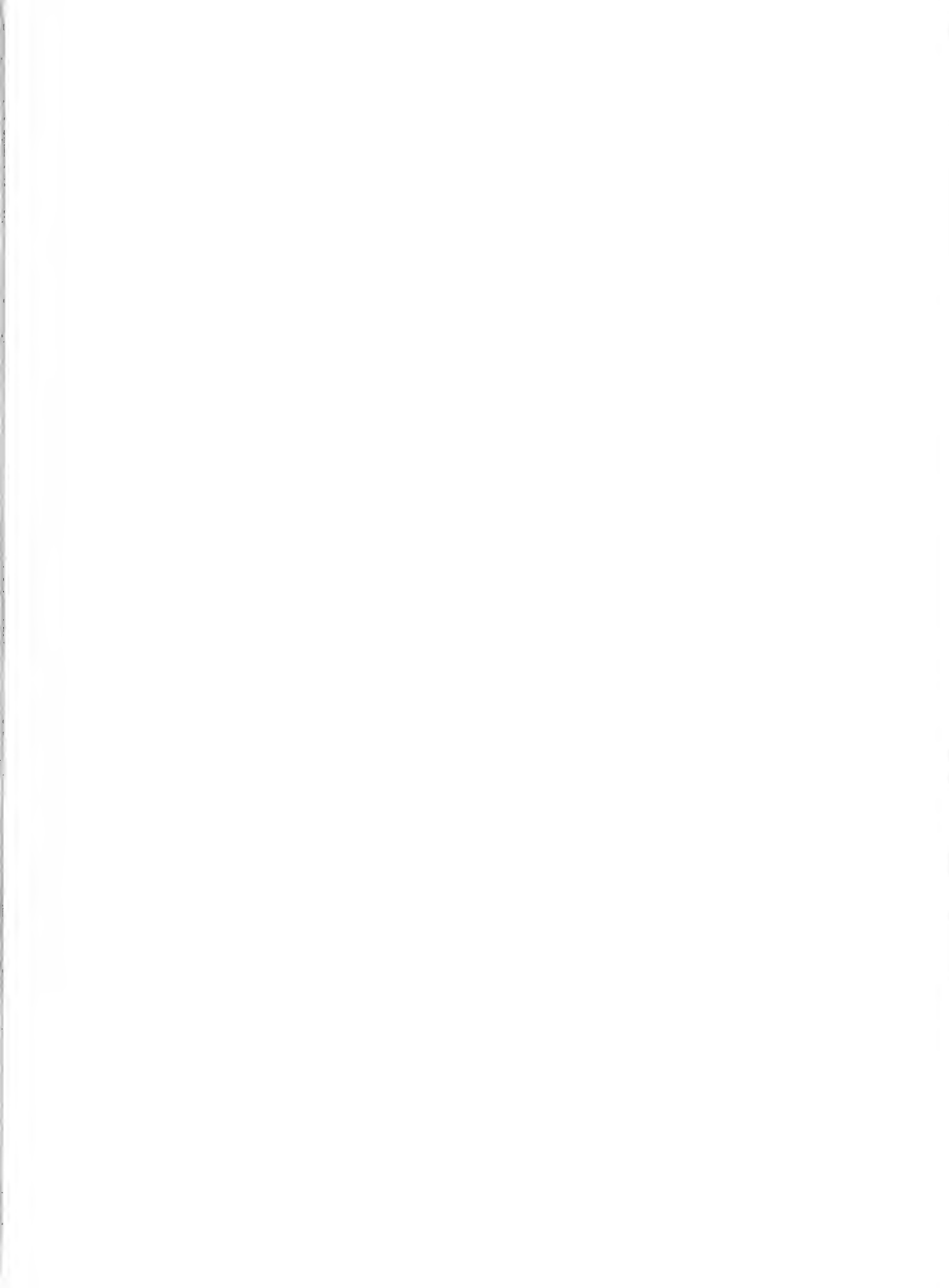
Pl. XXVII. Figs. 5 and 6. *Pronolagus ruddi kariegae* subsp.
nov.

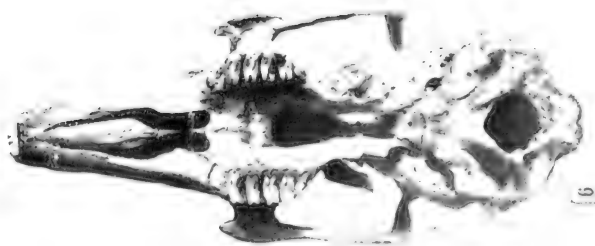
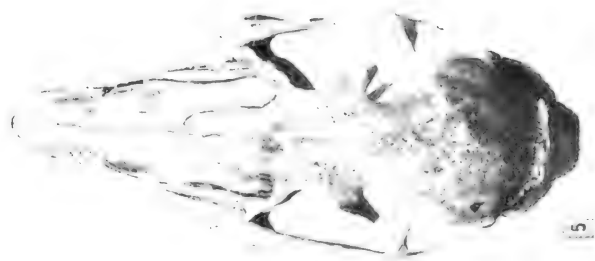
Fig. 7. *Pronolagus crassicaudatus bowkeri* subsp.
nov.

(All photographed from type specimens.)



1. *Pronotagus crassicaudatus bockeri* subsp. nov.
2. *P. crassicaudatus saundersiae* subsp. nov.
- 3 and 4. *Otomys roberisi* sp. nov.





5+6 *Pronolagus ruddi kariéga* subsp. nov.

7. *P. crassicaudatus beckeri* subsp. nov.

The Acanthodriline Earthworms of South Africa East of the 25° Meridian.

By G. E. PICKFORD, Mary Ewart Travelling Scholar 1925-26
and 1926-27, Newnham College, Cambridge.

INTRODUCTION.

Unless otherwise stated the new material described in this paper was collected recently by myself and is at present in my own collection. It is intended that types or cotypes should be sent to the British Museum, and cotypes where possible or paratypes to Dr. Michaelsen at the Hamburg Museum, to the South African Museum, Capetown, and in the case of Eastern Province material to the Albany Museum, Grahamstown. My thanks are due to many people in the Eastern Cape Province who gave me valuable help in collecting, especially to Dr. Rattray at East London, Mr. Stephens at Stutterheim, Capt Shortridge of the Kaffrarian Museum, and Mr. and Mrs. Page at Kingwilliamstown, the Misses Ross and Miss Erskine and others at Debe Nek, Mr. McDougall at Fort Hare, Mr. Hewitt of the Albany Museum and many others at Grahamstown, especially Miss Brock and Miss Saunders, and to Mrs. Ilsley at Port Elizabeth.

Attention may be called to certain peculiarities of distribution mentioned under the various species, especially to the occurrence of *Ch. laeviseta* at the Mont-aux-Sources and to the little colony of the more primitive *Acanthodrilacea* at Port Elizabeth in the extreme south. A complete list of the endemic species of the area with their localities is recorded below and a full bibliography together with discussions of distributional questions will be found in Michaelsen's papers for 1913 on the Oligochaeta of Natal and Zululand (Ann. Nat. Mus., vol. 2, pt. 4) and Die Oligochaten des Kaplandes (Zool. Jahrb. Syst. 34 Bd. 5/6 Heft).

Fam. MEGASCOLECIDAE.

Sub-fam. *Acanthodrilinae.*Section *Acanthodrilacea*.**Acanthodrilus ilsleianus* n.sp. Port Elizabeth.*Microscolex hansi* Mich. " "" *lussae* Mich. " "" *rivalis* n.sp. " "Section *Chilotacea.**Chilota algoensis* Mich. Port Elizabeth and Cape Peninsula." *elizabethae* Mich. f. *typica*. Port Elizabeth and Grahams-town." " " f. *elongata* n.f. Port Elizabeth." *braunsi* Mich. f. *typica*. Port Elizabeth and Natal." " " f. *amatolae* n.f. K.W.T and Stutterheim dist., Eastern Cape Province." *editha* n.sp. Stutterheim, Eastern Cape Province." *laeviseta* Mich. Drakensberg Mts., Basutoland, and Cape Peninsula." *warreni* Mich. Natal." *trågårdhi* Mich f. *typica* Mich. Zululand." " " f. *major* Mich. Natal." *wahlbergi* Mich. f. *typica* Mich. Natal." " " f. *pulchrior* Mich. Transvaal.*ACANTHODRILUS ILSLEIANUS* n.sp.*Locality.* Essexvale, Baakens River, Port Elizabeth, S.E. Cape Province, South Africa.*Habitat.* In the bank of a wooded backwater where the sandy subsoil was covered with a foot or so of loamy leaf mould.*Material.* Several clitellate, numerous semi-mature and juvenile specimens in all stages. Collected 19/3/26, in formalin.*External Characters.*

Dimensions. Length of clitellate specimens 80-95 mm. Maximum width about 2 mm. across the clitellum. Number of segments c. 140.

Colour. Non-pigmented, pallid anteriorly but greyish behind

*The two world wide peregrines *Microscolex phosphorus* and *dujui* are omitted.

the clitellum owing to the contents of the intestine. The clitellum yellowish pink.

Prostomium. Epilobic.

Clitellum. On segm. 13 or 14-17 or a part of 17, saddle shaped extending laterally to about setal line *b*.

Copulatory Papillae. Absent on the segments of the genital field (superficial distinction from *Microscolex rivalis* from the same locality). A ventral median or paired ventral papillae are frequently present on segm. 16 and 20, or at intersegm. 16/17 and 20/21.

Setae. Widely paired laterally, more closely paired ventrally. The ratios of intersetal distances approximately as follows:—

	<i>aa</i>	<i>ab</i>	<i>bc</i>	<i>cd</i>	<i>dd</i>	<i>dd</i> _v
At ant. end	2½	1	3	2½	6	⅓
At post. end	2	1	1+	1+	4	¼

The ventral setae *aa* converge slightly to each other, and *bb* converge slightly to *aa* respectively in the region of the genital field, this is best seen on young specimens in which setae *b* (?*a*) of the ventral pair are also seen to be present on segm. 18.

Nephridial Pores. In setal line *c* on the anterior borders of the segments.

Dorsal Pores. These were only visible posteriorly.

Spermathetical Pores. On very prominent paired papillae at intersegm. 7/8, 8/9 in setal line *b*.

Female Pores. Paired ventrally on segm. 14 anterior to the intersetal space *ab*.

Prostatic Pores. Paired on segm. 17 and 19 on prominent papillae in setal line *b*.

Seminal Groove laterally convex. There is a transverse furrow on segm. 18 ventrally between the male pores in fully clitellate individuals, in some specimens the long narrow genital field is divided longitudinally by a mid-ventral furrow between the swollen walls of the seminal groove.

Internal Anatomy.

Alimentary Canal. A large muscular gizzard in segm. 5.

The oesophagous has brown vascularised walls in segm. 9-15.

The intestine commences in segm. 19, or 20 with typhlosole.

Large paired lateral hearts occur in segm. 10-12.

Septae. 5/6 very thin, 6/7-11/12 well thickened, 12/13-14/15 decreasingly thickened.

Sperm Funnels. Large paired and free in segm. 10 and 11.

Sperm Sacs. Two pairs in segm. 11 and 12 from septae 10/11 and 11/12 respectively, much lobulated, those of segm. 12 larger.

Ovaries. Large and paired in segm. 13.

Oviducal Funnels. Large and horseshoe shaped.

Prostates. Very irregularly loosely coiled tubular glands occupying one or two segments each. The duct is long and narrow, one-third to one-half the length of the uncoiled glandular part.

Spermathecae. An irregularly shaped proximo-distally flattened spherical or transversely oval ampulla. The duct thick walled and somewhat egg shaped about as wide as the length of the ampulla or half as wide as the width. Two tubular unstalked diverticula open laterally into the duct near its proximal end, they are often very unequal in size and occasionally only one is present. Total length of ampulla and duct c. 1.1 mm. [Text fig. B. 2 c.]

Penial Setae. Two setal sacs per bundle with similar setae and containing one functional and one or two reserve setae. The seta is rather short and stout, when full grown it has a strongly marked elbow curve at the base and the distal half is slightly curved in the same direction. The seta gradually narrows towards the distal end which is flattened and broadened to form a very characteristic gouge shaped blade, ending in a curved transverse edge between two points. The distal $\frac{1}{4}$ of the seta is ornamented with broken rings of pronounced proximally convex scales. Length of a full grown seta c. 1.2 mm., thickness at the base c. 20.5μ , narrowing at the distal end to c. 3.5μ just below the blade, width just below blade c. 7μ , across blade c. 10.2μ (the last two measurements apply to a young seta but the width does not usually increase as the seta grows). [Text fig. B. 2 a-d.]

Sigmoid Setae. The distal $\frac{1}{4}$ ornamented with scales.

Remarks.

This species is the first of its genus to be recorded from South Africa outside the Cape Peninsula and Stellenbosch areas, although a relict species is known from the Cameroons.* It closely resembles *Ac. drygalskii*, but may be readily distinguished from it by the form of the penial setae and spermathecae, the latter being very elongate in *Ac. drygalskii*. These two species are at once distinguished from the remaining three Cape species [*Ac. arundinis*,† *Ac. purcelli* and *Ac. peringueyi*] in having similar setae in the two "sub-bundles" or setal sacs (corresponding to the ventral setae *a* and *b* which they replace) of each bundle.

MICROSCOLEX RIVALIS n.sp.

Localities.

(1) Frames Drift, Port Elizabeth, S.E. Cape Province (Co-types).

(2) Essexvale, Baakens River, Port Elizabeth, S.E. Cape Province.

Habitat. In pockets of loamy soil along the bank and backwaters of the river under trees, but not in the more sandy soil and subsoil round about.

Material.

(1) Five clitellate specimens collected 20/3/26, in formalin (Co-types).

(2) Several clitellate specimens including a copulating pair, and one juvenile; collected 19/3/26, in formalin (Paratypes).

External Characters.

Dimensions. Length 60-73 mm. Maximum width 1½ mm.

Number of segments c. 110-120.

*1903. *Notiodrilus* (?) *valdiviae* W. Michaelsen. Wiss. Erg. Deutsch Tiefsee Exh., 3 Bd., p. 147, pl. 22, fig. 7.

1905. *Microscolex* (N) *valdiviae* W. Michaelsen. Die Oligochaten Deutsch Sudpolar Exp. ix, Zool. 1.

†Only one form of penial seta has been described for this species but a careful examination has shown there to be a second type present which is small and reduced. One as yet undescribed form of *Ac. drygalskii* also shows incipient differentiation of setae from the two sub-bundles. It is intended to publish these results shortly in a paper dealing with *Acanthodrilinae* from the Western Cape Province.

Colour. Non-pigmented, the anterior end creamy white but posterior to the clitellum greyish owing to the contents of the intestine.

Prostomium. Epilobic; in one specimen the sutures very indefinite.

Clitellum. $\frac{1}{2}$ 13 or 14-16 or $\frac{1}{2}$ 17 never quite complete ventrally.

Copulatory Papillae. Small papillae are usually present on the posterior border of segm. 7 and 8 and the anterior border of segm. 8 and 9 close to the spermathecal pores, but their occurrence is variable. Small paired or larger median ventral papillae frequently occur on segm. 16 and 20. In the genital field numerous irregularly placed small sucker-like papillae are always present, these may be ventrally on segm. 17, 18 or 19 or at intersegm. 17/18 or 18/19, and are paired, median or asymmetrical. Similar small papillae frequently occur just external to the prostatic and male pores. [Text fig. C. 1.]

Setae. Widely paired, the ratios of intersetal distances approximately as follows:—

	<i>aa</i>	:	<i>ab</i>	:	<i>bc</i>	:	<i>cd</i>	:	<i>de</i>	<i>de</i> / μ
At ant. end	3	:	1	:	4	:	2	:	8	$\frac{1}{3}$
At post. end	2	:	1	:	2	:	$1\frac{1}{2}$	:	4	$\frac{1}{4}$

Owing to a deep transverse groove between the male pores it was impossible to determine whether the ventral pairs of setae were present on segm. 18.

Dorsal Pores. These are only visible posterior to the clitellum.

Nephridial Pores. On the anterior borders of the segments slightly internal to setal line *c*.

Spermathecal Pores. On prominent paired papillae at intersegm. 7/8, 8/9 in the setal line *b*.

Female Pores. On segm. 14 paired, anterior and slightly external to seta *a*, conspicuous.

Prostatic Pores. On segm. 17 and 19 paired on prominent papillae in setal line *b*.

Male Pores in the seminal groove in setal line *b*.

Seminal Groove, laterally convex or rather convex but inbent in the middle of segm. 18 to the male pore.

Internal Anatomy.

Alimentary Canal. The gizzard soft and scarcely distinguishable from the pharynx in segm. 5. An oesophageal constriction in segm. 14 and 15 precedes the intestine which widens in segm. $\frac{1}{2}$ 16.

Septae. 6/7-9/10 thickened, 10/11 to about 13/14 decreasingly thickened.

Large pairs of lateral hearts in segm. 10, 11 and 12.

Sperm Funnels. Two pairs of equal size, free in segm. 10 and 11.

Sperm Sacs. Two pairs in segm. 11 and 12 from septae 10/11 and 11/12 respectively, much lobulated.

Ovaries. Conspicuous.

Oviducal Funnels horseshoe shaped, without an oviducal pouch.

Prostates, occupying 4 segments each. In the first a straight thin duct followed in the remaining three by a thick tubular, irregularly and slightly but closely coiled gland.

Spermathecae. Ampulla irregularly spherical, transversely flattened, about equal in length to the thick egg-shaped duct from which it is sharply separated. Two diverticula open proximally into the duct, they are unstalked, tubular and very unequal in size. Total length of ampulla and duct about 0.8 mm. [Text fig. B. 3 d, Pl. 2.]

Penial Setae. Two setal sacs per bundle with similar setae, each containing one functional and one or two reserve setae. The full grown seta is short and stout, somewhat curved towards the distal end and recurved slightly in a S-shaped manner at the very tip. The extreme distal end is flattened and a trifle broadened to form a blunt irregular blade which appears to be much softer than the stem and is easily distorted. In side view it frequently appears as a point bearing a lateral blade or flange. The distal $\frac{1}{2}$ is ornamented with large, somewhat jagged or tooth edged, proximally convex scales, placed more or less alternately.

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Length of full grown seta c. 0.6 mm., thickness at base c. $14\frac{1}{2}\mu$
at tip just below blade c. 3.5μ . [Text. fig. B. 3 a-c.]
Sigmoid Setae. The distal $\frac{1}{3}$ ornamented with fine scales.

Remarks.

This species is closely allied to *M. hansi* Mich. but differs from it in the absence of pigmentation, in the presence of numerous small copulatory papillae in the region of the genital field, and in the exact form of the penial setae as well as in other minor points. It belongs to what Michaelsen terms the "*acanthodrilin*" group of the genus *Microscolex* in which "*microscolesin*" reduction (the loss of the posterior pair of spermathecae and prostates) has not yet occurred and which only differs from the parent genus *Acanthodrilus* in the reduction of the gizzard.

CHILOTA LAEVISETA Mich.

1913. *Chilota laeviseta* W. Michaelsen. Zool. Jahrb. Syst. 34
Bd. 5/6 Heft, pp. 501-502, 1 fig. of spermatheca.

Michaelsen had a single specimen of this species from Camps Bay in the Cape Peninsula. The specimen discussed below only differs from the description of the type in a few minor characters. A complete account of this specimen has been given partly because no English description of the species exists and partly because these minor differences may assume greater significance when more material has been examined from both localities. Unless otherwise stated the characters described agree with those of the type, but in addition certain characters not mentioned by Michaelsen are described.

Locality. Mont-aux-Sources, Drakensberg Mts., Basutoland.

Material. One non-clitellate semi-mature specimen in alcohol, collected in Jan., 1926, by R. Essex [at Albany Museum, Grahamstown].

External Characters.

Dimensions. Length 87 mm. Maximum width 6 mm.
Number of segments c. 168,

Colour. Pigmented, red-brown dorsally extending laterally to the setal line *c* over the anterior half of the body, decreasing in extent to the setal line *d* over the posterior half. Pallid ventrally except on the first 5 segments which are somewhat pigmented below. A pallid fleck dorsally on segm. 5 extending laterally on to segm. 6 on the R. side, this is perhaps due to injury.

Prostomium. Tanylobic.

Clitellum. Not developed [in Michaelsen's specimen on segm. 13-17, complete ventrally only on segm. 13].

Copulatory Papillae. Absent [the ventral seta of the type on segm. 18 and 20 doubtfully on papillae].

Setae. Widely paired, the ratios of intersetal distances approximately as follows:—

	<i>aa</i>	<i>ab</i>	<i>bc</i>	<i>cd</i>	<i>dd</i>	$\frac{dd}{u}$
On segm. 9.	4	3	$5\frac{1}{2}$	3	12	$\frac{5}{11}$
At post. end	5	3	4	4	8	$\frac{1}{3}$

[These figures differ somewhat from Michaelsen's especially at the anterior end where the intersetal distance *aa* is proportionately greater.]

In the region of the prostatic pores the ventral setae *aa* diverge from each other and converge respectively to *bb*. The ventral pairs *ab* are present on segm. 18.

Annulation of Segments. Segm. 7, 8 and 10, 11 are divided dorsally and laterally by a furrow just posterior to the setae. Segm. 9 is similarly triannulate, the middle annulus bearing the setae. Posterior to this the setae are raised on a ridge round the middle of the segment but there is no annulation. [No annulation is described for Michaelsen's specimen.]

Nephridial Pores in a line just above the setal line *c* [in Michaelsen's specimen in setal line *c*].

Dorsal Pores. Apparently absent.

Spermathecal Pores. Not visible externally [in Michaelsen's specimen in setal line *b*], but see under internal anatomy.

Female Pores. On segm. 14 prd. just anterior to the ventral setae *aa*. [Not described by Michaelsen.]

Prostatic Pores. Paired on segm. 17 and 19 in setal line *b*, on pallid oval papillae.

Male Pores. On segm. 18 just external to seta *b*, paired.

Internal Anatomy.

Alimentary Canal. A moderately large gizzard in segm. 5. Oesophagous without calciferous glands, widening abruptly in segm. 16, to form a very transparent walled intestine without typhlosole [the first intestinal segment is not mentioned by Michaelsen].

Large lateral hearts occur in segm. 10-13, anterior to this are small lateral commissural vessels in segm. 5-9 [position of the last pair of hearts not mentioned by Michaelsen].

Septae. 4/5 and 5/6 very thin, 7/8-12/13 thickened, 6-7 and 13/14 slightly thickened, 14/15 and 15/16 less so.

Testes and Sperm Funnels. One pair free in segm. 10.

Sperm Sacs. Two pairs from septae 9/10, 10/11 in segm. 9 and 11 respectively. Those of segm. 9 simple, of segm. 11 larger and lobulated.

Vas Deferens passing transversely outwards in segm. 11 to just beyond the setal line *b*, then passing backwards parallel and just external to the setae to the male pore [not described by Michaelsen].

Ovary. A rather tufted gland in segm. 13 [not described by Michaelsen] from the anterior septum.

Oviducal Funnel and Duct without an oviducal pouch or gland [not described by Michaelsen].

Prostates. Closely coiled tubular glands confined to one segment. The duct of about the same diameter as the glandular portion and equal in length to about one-third of the coiled gland mass. There is a constriction where the duct opens into the gland. [Michaelsen describes the duct as very short and thin.]

Penial Setae. Two setal sacs per bundle with similar setae, each containing one nearly full grown and two reserve setae. The setae are smooth without any form of ornamentation, rather orange brown in colour, somewhat curved especially at the distal end, and flattened in a plain at right angles to the plain of

curvature. The width remains approximately constant along the whole length of the seta but decreases a little towards the tip. The distal end is, in younger setae, flattened and somewhat broadened to form an extremely thin bluntly pointed blade; in older setae the edges of the blade are inrolled and apparently fused(?) to form a solid tip of a rather blunt, irregular and buckled up shape. Length of longest seta from L. ant. bundle 1.1 mm., width from 24 to 27 μ [in Michaelsen's specimen both length and width greater]. [Text. fig. B, 1 a, b and c.]

Sigmoid Setae. Ornamented with a few fine scales at the distal end. [Text fig. B, 1 d] [not described by Michaelsen.]

Spermathecae. In segm. 8 and 9 opening at intersegm. 7/8 and 8/9 in the setal line *b*. Ampulla irregularly flask shaped about twice as long as broad and somewhat flattened transversely, passing gradually into the duct which is about one-third as long and one-quarter as wide as the ampulla. An oval or irregularly bilobed (L. ant.) or longitudinally ridged (L. post.) diverticulum opens into the duct on its anterior side just before it passes into the ampulla. [Text fig. C, 6 a and b.] [Michaelsen gives a very detailed description with which this is in approximate agreement.] Total length of ampulla and duct 1.8—2.0 mm.

Discussion.

The distribution of the species, represented so far by only two specimens from the Drakensberg Mts., Basutoland and Camps Bay in the Cape Peninsula respectively, is so remarkable as to deserve special consideration. The possibility that it is a relict species immediately suggests itself. The genus *Chilota*, known also from South America and the Cape Verde Islands, is itself a member of the relict Cape fauna. In the S.W. corner of the Cape it blossoms into some twenty endemic species many with characteristic local races, whereas in the whole of the Eastern Cape Province, Natal and the Transvaal it is only represented by six species [excluding *Ch. laeviseta*]. Of these five are endemics but one is also known from the West [*Ch. algoensis*†

†*Ch. algoensis* W. Michaelsen. Mt. Mus. Hamburg Heft 15. p. 104.
text fig. 22.

Zool. Jahrb. Syst. 34 Bd, 5, 6 Heft.
p. 526.

from Port Elizabeth and the Cape Peninsula]; three have a very wide distribution and may be regarded as to some extent peregrines [*Ch. elizabethae*, *Ch. braunsi* and *Ch. wahlbergi*]. It thus becomes obvious that *Ch. laeviseta* is a very isolated representative of the Western Cape fauna. Anatomically it may be considered primitive in one or perhaps two characters. The additional pair of hearts in segm. 13 does not, as far as is at present known, occur in any other South African member of the genus; it occurs however in a few South American species and quite frequently in non-African species of the parent genus *Acanthodrilus*. The smooth unornamented penial setae are perhaps primitive but more probably secondarily simplified. The position of the gizzard in segm. 5 is certainly more primitive than in segm. 6, but the latter condition only occurs rather infrequently in the genus. In certain characters *Ch. laeviseta* is less primitive than some other members of the genus; for example the absence of pigmentation is probably more primitive than its presence, and the possession of a single spermathecal diverticulum more specialised than the presence of a pair, the latter condition occurs in two of the Natal species [*Ch. warreni** and *Ch. trögårdhi*†], in a few South American species and is characteristically present in the parent genus *Acanthodrilus*.

CHILOTA EDITHA n.sp.

Locality. Close to Cumakala River below the old graveyard at Stutterheim, Eastern Cape Province, South Africa.

Habitat. The bank of a small dry rivulet in a wood, among grass roots in damp loamy soil.

Material. One clitellate specimen, collected 9/2/26, in formalin.

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- *1913. *Ch. warreni* W. Michaelsen. Annals Natal Mus., vol. 2, pt. 4, p. 411-414, figs. 1 and 2, plate 32.
 †1907. *Ch. trögårdhi* .. Ark. Zool. 4, nr. 4, p. 3, text figs. 1 and 2.
 1913. .. f. *typica*. Annals Natal Mus., vol. 2, pt. 4, p. 414.
 1913. .. var. *major*. Annals Natal Mus., vol. 2, pt. 4, p. 415, figs. 4 and 5, plate 32.

External Characters.

Dimensions. Length 8.0 mm. Maximum width 3 mm. Number of segments c. 122.

Colour. Pigmented dorsally, greyish red at the anterior end extending laterally to setal line *c*, decreasing behind the clitellum to a red-brown pigmentation over the mid-dorsal line, but increasing in extent at the posterior end again. Pallid yellow-brown ventrally.

Prostomium. Tanylobic.

Setae. Widely paired; the ratios of intersetal distances approximately as follows:—

	<i>aa</i>	:	<i>ab</i>	:	<i>bc</i>	:	<i>cd</i>	:	<i>de</i>	:	<i>de</i> / _{<i>u</i>}
At ant. end	4	:	2	:	4	:	3	:	12	:	$\frac{1}{3}$
At post. end	3	:	2	:	3	:	3	:	6	:	$\frac{1}{5}$

The ventral pair of setae are present on segment 18, but seta *b* is deeply embedded in the wall of the seminal groove and *a* approximates more closely to *b*.

Clitellum. On segm. 14-16 dorsally and laterally, complete ventrally on $\frac{1}{2}$ 14- $\frac{1}{2}$ 16.

Copulatory Papillae. A small pair on the posterior border of segm. 8 in the setal line *b* and on the posterior border of segm. 9 in the intersetal line *ab*. Another small papilla ventrally on the R. side of segm. 18 just internal to seta *a*.

Nephridial Pores. Not visible externally, ? in setal line *c*.

Dorsal Pores. Not visible externally, ? absent.

Spermathecal Pores. In setal line *b* at intersegm. 7/8, 8/9. Very inconspicuous externally but one was rendered visible by the removal of a spermatheca for examination.

Female Pores. On segm. 14 anterior to seta *a*.

Prostatic Pores. On paired papillae on segm. 17 and 19 in setal line *b*.

Male Pores. On segm. 18 just external to seta *b* in seminal groove.

Seminal Groove laterally convex.

Internal Anatomy.

Alimentary Canal. Gizzard well developed in segm. 5.

Oesophagous with swollen vascularised walls in segm. 12-14. constricted in segm. 15. Intestine commencing in segm. 16 and gradually widening. Typhlosole absent.

Large lateral Hearts in segm. 10-12.

Septae. 5/6 thin, 6/7 somewhat thickened, 7/8-15/16 well thickened, 16/17 less so.

Sperm Sacs. Two pairs from septae 9/10 and 10/11 in segm. 9 and 11 respectively; those of 9 simple, of 11 much lobulated.

Testes and Sperm Funnels. One pair, free, in segm. 10.

Prostates occupying two segments each, the gland closely coiled and tubular, passing back and then forwards on itself again. The duct narrow and about half a segment in length passing backwards to open into the glandular part at the septum behind. [Text fig. A, 1 a-c.]

Penial Setae. Two setal sacs per bundle with similar setae, each containing one functional and one reserve seta. The full grown setae are curved in an arc about one-third the circumference of a circle, at the distal end the curvature is accentuated to form a slight elbow. The seta gradually narrows from the base towards the tip, the distal end is flattened and somewhat broadened again to form a bluntly pointed blade. The distal $\frac{1}{4}$ of the seta is ornamented with fine scales or teeth irregularly placed in two longitudinal rows on the concave side. Length c. 1.8 mm.; thickness at base 24.5μ , at tip 12.5μ ; width across blade 18.5μ .

Sigmoid Setae. The distal end is ornamented with small scales.

Spermathecae. Ampulla irregularly flask shaped, somewhat flattened transversely, narrowing at the distal end but widening at the base before it again narrows to pass gradually into the duct. Duct half as wide and about one-third as long as the ampulla. A single bilobed diverticulum opens into the duct anteriorly about its junction with the ampulla. The diverticulum is somewhat dumbell shaped, the neck where the two lobes unite, forming a bridge across the anterior side of the duct. [Text fig. C 3.] Total length of ampulla and duct c. 1.7 mm.

Remarks.

This species closely resembles *Ch. braunsi* Mich. but differs from it as follows:—

- (1) The intestine commences in segm. 16 instead of segm. 17.
- (2) The spermathecal ampulla is more elongate, the diverticulum is somewhat bilobed and shows no tendency to become ridged or warted.
- (3) The penial setae have an arc-like rather than a sigmoid curvature at the distal end. The toothing is confined to the concave side of curvature and even the young setae are not tinged with pink.

Ch. editha is also rather greyer in colour and the spacing of the setae differs somewhat.

CHILOTA BRAUNSI Mich. f. AMATOLAE n.f.

Localities. Eastern Cape Province, South Africa.

- (1) Near the Trout Hatchery, Pirie Forest, Kingwilliamstown.
- (2) Below the forester's cottage at Isedenge, Stutterheim.

Habitat. Under rotting bark and leaf mould in the native forest (at Pirie) and in an oak plantation (at Isedenge); a single specimen was found in the soil at grass roots in the bank of a stream near the wood at Isedenge but this was evidently a less congenial environment.

Material.

(1) Nine clitellate, four semi-mature, three young but showing incipient copulatory papillae and four juvenile specimens. Collected 19/2/26, in formalin.

(2) Two normal clitellate, two semi-mature and one juvenile specimens. One aberrant clitellate specimen in which owing to partial fission of segm. 16 on the left the prostatic and male pores of that side are shifted forward by one segment. [Text fig. C 2.] Collected 7/2/26, in formalin.

Habits. This is a very active species, performing violent gymnastics and frequently autotomising the end of the tail when irritated. It can be caught like many of the Cape species by

wirling a stick or tapping the ground, when the worms will come to the surface.

External Characters.

Dimensions. Length about 80 mm. Maximum width about mm.

Colour. Pigmented, red-brown dorsally extending laterally at the anterior end to the setal line *c*, decreasing posteriorly to a mid-dorsal longitudinal line. Yellow brown ventrally. Clitellum pinkish brown or greyish.

Copulatory Papillae. Paired or median ventral on any of segm. 8-10 and intersegm. 10/11, 11/12, 15/16 and 19/20 and 20/21.

Setae. Widely paired, the ratios of intersetal distances approximately as follows:—

	<i>aa</i>	<i>ab</i>	<i>bc</i>	<i>cd</i>	<i>dd</i>	<i>dd</i> / _{<i>u</i>}
At ant. end circa.	4	3	3	5	10 or 12	$\frac{1}{3}$ to $\frac{1}{4}$
At post. end circa.	4	3	4	4	8	$\frac{1}{4}$
(but in one specimen	3	2	3	3	4	$\frac{1}{6}$

The great variation shown is probably due to different degrees of contraction of the circular musculature.

In the region of the prostatic pores the ventral setae *aa* diverge from each other and converge respectively to *bb*.

The ventral pair of setae are present on segm. 18.

In other external characters as in *f. typica*.

Internal Anatomy.

Alimentary Canal. A moderately large gizzard in segm. 5.

The intestine commencing abruptly in segm. 17.

Large pair of lateral Hearts in segm. 10-12.

Prostates occupying 2 segments each.

Spermathecae. In fully mature specimens the spermathecal diverticulum is lobed or warted [Text fig. C 4 b], in other somewhat less fully mature specimens it may be only ridged, while in young specimens it is simple. [Text fig. C 4 a.]

The ampulla is globular in fully mature specimens and darkly coloured inside, in less mature specimens it is flask shaped.

Penial Setae. Two setal sacs per bundle with similar setae

each containing one full grown and sometimes a small reserve seta. The full grown setae strongly curved, especially towards the distal end, which is recurved in an S-shaped manner at the tip. The distal recurved end is flattened and a little broadened to form a pointed blade which appears in side view to be a sigmoid hook often with a slight flange owing to a symmetrical broadening. The distal $\frac{1}{4}$ is, with the exception of the extreme tip, ornamented with rings of fine toothings, or with isolated teeth arranged in alternating rings or irregularly. Length of full grown seta about 1.5 mm., width at base c. 28μ narrowing to a thickness of c. 13μ at the distal end below the blade, maximum breadth of blade c. 34μ .

Sigmoid Setae. The distal $\frac{1}{4}$ ornamented with fine scales or teeth. The young sigmoid setae are like the young penial setae faintly tinged with pink.

In other characters the internal anatomy is as described for *f. typica*.

Discussion.

F. amatolae agrees with *f. typica** Mich. in all essential characters, but may be distinguished from it as follows:—

(1) the body is slenderer with a maximum width of 3 mm. instead of 5 or 6 mm. The intersetal distance *dd* is proportionately narrower.

(2) The clitellum is constantly of less extent, covering segm. $\frac{1}{2}$ 13 or 14-16 instead of 13 or $\frac{1}{2}$ 13 to 18.

(3) The copulatory papillae tend to develop across intersegmental furrows so as to lie with the anterior half on one segment and the posterior half on another. Midventral papillae at intersegm. 10/11, 11/12 and 15/16, and ventrolateral papillae at intersegm. 19/20 and 20/21 are especially frequent. Only one semi-mature specimen out of 21 in which copulatory papillae had developed was quite without these intersegmental papillae, whereas they have never been described for *f. typica*.

*1899. *Chilota braunsi* W. Michaelsen. Mt. Mus. Hamburg 16, p. 102, 1 text fig. distal end of penial seta.
1913 " " Annals Natal Mus., vol. 2, pt. 4, p. 416.

(4) The gizzard is in segm. 5, whereas in *f. typica* it is said to be in segm. 6 with only its anterior portion in segm. 5.

(5) The penial setae are shorter, 1.5 mm. long instead of 2.3 mm., and less thick, c. 28μ at base instead of c. 36μ , but otherwise agree very closely with those of *f. typica*.

CHILOTA ELIZABETHAE *f. TYPICA* Mich.

1899. *Chilota elizabethae* W. Michaelsen. Mt. Mus. Hamburg 16, p. 101.

1913. Ditto, redescription of spermathecae. Zool. Jahrb. Syst. 34 Bd. 5/6 Heft, 1 fig. spermatheca.

Through the kindness of Dr. Michaelsen I have been able to examine a co-type of this species in conjunction with more material collected recently by myself. Certain new or inadequately described characters are discussed below.

Localities. S. Eastern Cape Province, South Africa.

(1) Port Elizabeth (Co-types).

(2) Donkerbosch, near Grahamstown.

Habitat. No habitat is described for the co-types; the Grahamstown specimens were found near a waterfall in native forest, among wet decaying leaves, roots of grass and rotting wood.

Material.

(1) Co-types, 7 specimens of which the one examined by myself is not fully clitellate. Collected by Dr. Brauns, in alcohol.

(2) Very numerous specimens of which most have a partially developed clitellum, but none are fully mature. Collected 12/3/26, in formalin.

External Characters.

Dimensions. Many of the Grahamstown specimens are about a centimetre longer than the longest of the co-types.

Prostomium. In about half the Grahamstown specimens the prostomium is schizolobic, i.e. epilobic with a transverse furrow joining the distal ends of the two longitudinal side furrows. In the remaining specimens the condition may be described as schizo-epilobic, i.e. the side furrows are continued a little way behind the transverse furrow. The cross furrow is described

for the co-types by Michaelsen, but in the specimen examined by myself is peculiar in being double. [Text fig. C. 7 a and b.]

Copulatory Papillae. These are stated to be absent by Michaelsen, but incipient papillae occur as follows in the co-type examined by myself:—

On segm. 9 L. just internal to seta *b*.

R. anterior to seta *b*.

On segm. 10 Paired anterior to seta *b*.

On segm. 11 Paired anterior to intersetal space *ab*.

On segm. 12 Paired anterior to intersetal space *ab*, but proximal to seta *a*.

In most of the Grahamstown specimens copulatory papillae occur in the region of segm. 8-11.

Female Pores. On segm. 14 anterior to seta *a* on small paired papillae.

Internal Anatomy.

Alimentary Canal. The gizzard both of the co-type examined by myself and the Grahamstown specimens is in segm. 5. Michaelsen was doubtful whether it was in 5 and/or 6.

An oesophageal constriction in segm. 15 and 16 precedes the commencement of the intestine which widens in segm. 17.

Large pairs of Hearts in segm. 10-12.

Sperm Sacs are apparently always absent in segm. 9 as is described by Michaelsen.

Penial Setae. Two setal sacs per bundle with similar setae, each with one functional and two or three reserve setae. The full grown seta is long, thin and irregularly curved. The distal end, described by Michaelsen as "spatelformig," is, more correctly, gouge-shaped, a broadened groove-like blade between two pointed edges; often, especially in the younger setae, it is irregularly shaped, a flattened, broadened blade ending in two or three jagged points. The distal end is ornamented with a few rings of fine toothing below the blade. [Text fig. A 3 c-e]. The full grown setae are about 1.3 mm. long [Michaelsen's are described as 1.7 mm.), and 11μ thick at base narrowing to 3.5μ at the distal end.

Sigmoid Setae. The distal end ornamented with fine scales or teeth near the tip.

CHILOTA ELIZABETHAE Mich. f. ELONGATA n.f.

Locality. Frame's Drift, Port Elizabeth, Eastern Cape Province, South Africa.

Habitat. In a deposit of loamy soil among grass roots along the river bank, elsewhere worms did not occur as the bank was sandy. The worms may have been carried down by the river in flood and deposited in pockets of vegetable debris.

Material. Five clitellate specimens, collected 20/3/26, in formalin, narcotised with dilute alcohol before fixation.

These specimens agree with f. *typica* in all essential characters but differ as follows:—

(1) Size larger. They appear considerably longer, the longest 111 mm. instead of 57 mm., but this is in part due to the method of fixation. That they are actually larger is shown by the diameter which is about the same as in the typical form in spite of the greater length. The number of segments (c. 106) is the same as that of the largest type specimen but greater than that of the Grahamstown specimens (c. 75).

(2) The anterior end especially is more deeply pigmented and has a violet iridescence.

(3) The prostomium is epilobic except in one specimen where there is a transverse furrow converting it to schizopilobic.

(4) Copulatory papillae occur variably at certain intersegmental furrows immediately behind the genital field, e.g. at 21/22, 22/23 and 23/24, they may be paired latero-ventral, or partially fused or median ventral, but occur in all five specimens. Such papillae never occur in f. *typica* as far as is at present known, and may be regarded as specially distinctive of f. *elongata*. F. *elongata* differs in this respect from f. *typica* in just the same way that *Ch. braunsi* f. *amatolae* differs from *Ch. braunsi* f. *typica*. Copulatory papillae also occur as in f. *typica* on any of the anterior segments 8-12.

[Text fig. A. 3 a and b, Penial Setae. Text fig. C. 5, Spermatheca.]

CHILOTA WAHLBERGI f. *PULCHRIOR* Mich.

1912. *Chilota wahlbergi* W. Michaelsen. Zoologica Heft 67, 3 figs.

1913. *Chilota wahlbergi* f. *pulchrior* W. Michaelsen. Annals Natal Mus., Vol. 2, pt. 4, p. 416.

Michaelsen collected the co-types of this form at Witpoortje in the Middelburg district of the Transvaal. Specimens from the new locality given below agree entirely with descriptions of the co-types,* but in addition certain characters not recorded by Michaelsen are described.

Locality. Witpoortje Falls, Krugersdorp district, Transvaal.

Habitat. In wet soil among the roots of grass and moss growing behind the spray of the water.

Material. Numerous specimens in all stages of development, collected 16/10/26 and 29/9/26, in formalin.

External Characters.

Copulatory Papillae. In the genital field these may occur at the intersegmental furrows instead of on the segments, e.g. at 18/19 and 19/20 single or paired. Otherwise as described.

Female Pores. On segm. 14 paired anterior to seta *a*.

Prostatic Pores. Paired on segm. 17 and 19 on prominent papillae slightly pigmented with red brown in setal line *b*.

Male Pores. In setal line *b* just external to seta *b* of segm. 18.

Seminal Groove, laterally convex with male pore at apex.

Setae *a* and *b* present on segm. 18.

Internal Anatomy.

Alimentary Canal. A long, not very muscular gizzard in segm. 5.

The intestine commences abruptly in segm. 17.

Large pairs of lateral hearts in segm. 10-12.

**F. pulchrior* only differs from *f. typica* in pigmentation and the details of its characters are therefore those of the latter: see W. Michaelsen Ofv. Vet. Forh. 61, p. 441, 1899; also Das Tierreich Oligochaeta 1900.

Penial Seta. Two setal sacs per bundle with similar setae, each containing a full grown seta. The setal sacs lie parallel and close to the prostates, extending to two segments beyond them where they are attached to the body wall, and occupying 7 or 8 segments in all. When released from the body wall the setae tend to bend and coil up. The full grown setae are as described for f. *typica* by Michaelsen, but the leaf-like distal end is a trifle boat-shaped, the mid-rib forming a keel, and may end irregularly.

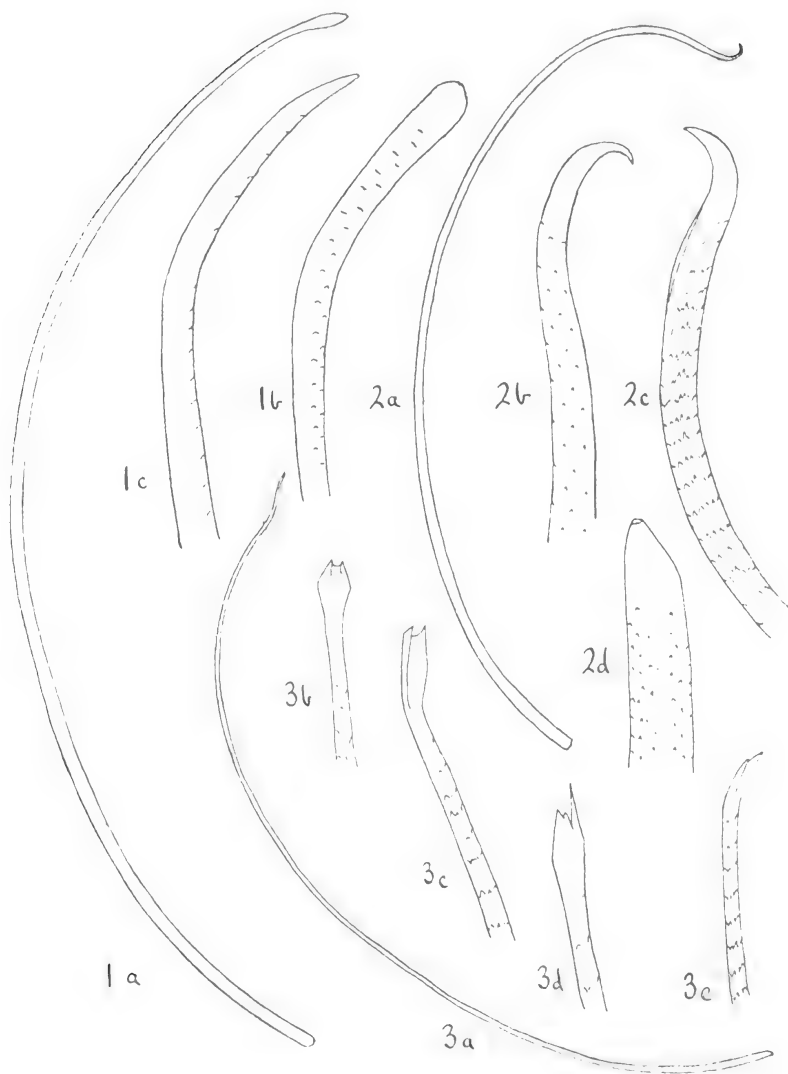
Sigmoid Setae. The distal end ornamented with fine scales or fittings.

Remarks. This is the only endemic Acanthodrilid recorded from the Transvaal, and one of the very few indigenous earthworms.

DESCRIPTION OF THE TEXT FIGURES.

A.

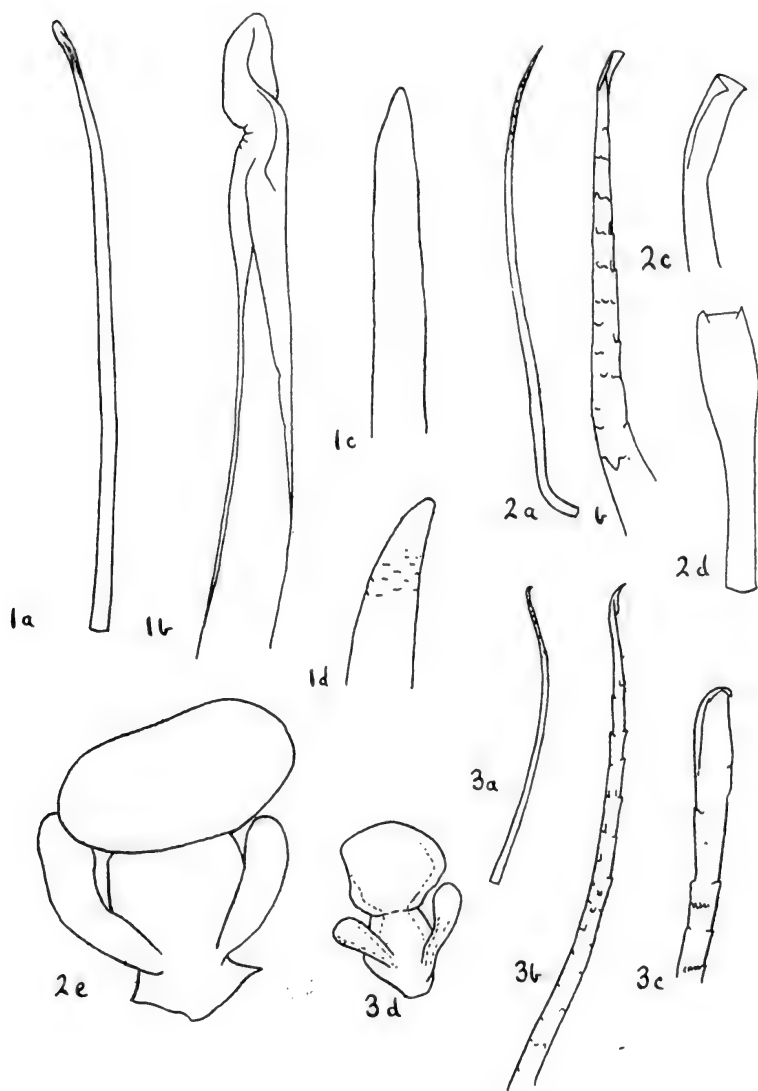
1. *Chilota editha* n.sp.
 - a. Full grown penial seta, side view.
 - b. Distal end of same, face view.
 - c. Distal end of another penial seta, side view.
2. *Chilota braunsi* f. *amatolae*.
 - a. Full grown penial seta (specimen from Isidenge), side view.
 - b. Distal end of same, side view.
 - c. Distal end of penial seta from another specimen (from Pirie), side view.
 - d. Distal end of penial seta of another specimen (from Pirie), face view.
3. *Chilota elizabethae* Mich.
 - a. Full grown penial seta of f. *clongata*, side view.
 - b. Distal end of another penial seta of f. *elongata*, face view (aberrant).
 - c. Distal end of penial seta of f. *typica*, face view.
 - d. Distal end of young penial seta of another specimen of f. *typica*, face view (aberrant).
 - e. Distal end of penial seta of a co-type of f. *typica*, side view.



Text fig. A.

B.

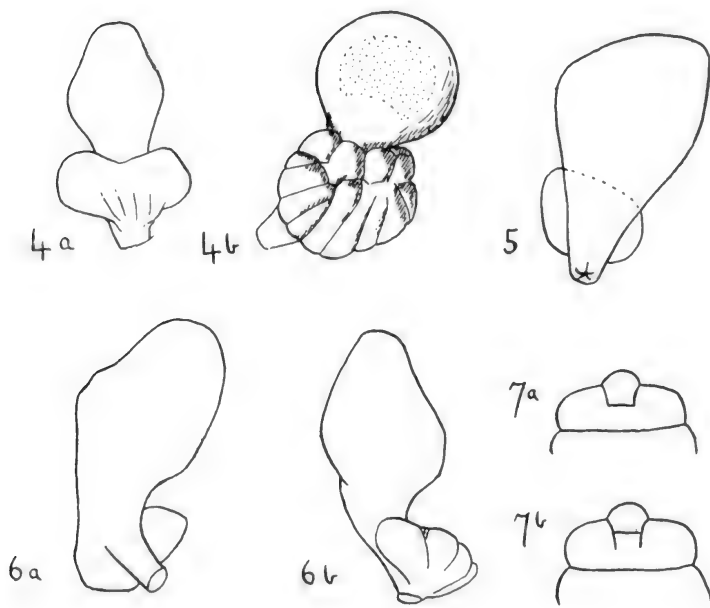
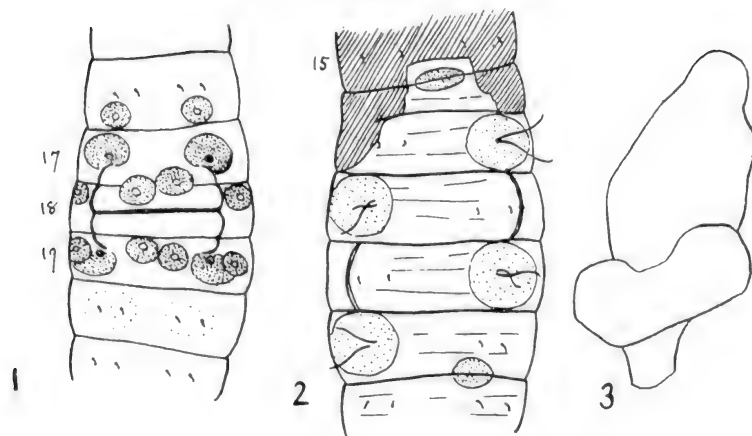
1. *Chilota laeviseta* Mich. from Mont-aux-Sources.
 - a. Nearly full grown penial seta, face view.
 - b. Distal end of same, face view.
 - c. Distal end of a young penial seta, face view.
 - d. Distal end of a sigmoid seta, side view.
2. *Acanthodrilus ilsleianus* n.sp.
 - a. Full grown penial seta, side view.
 - b. Distal end of same, side view.
 - c. Extreme distal end of another penial seta, side view.
 - d. Very young penial seta, face view.
 - e. Left anterior spermatheca, anterior view.
3. *Microscolex rivalis* n.sp.
 - a. Full grown penial seta, side view.
 - b. Distal end of same, side view.
 - c. Extreme distal end of another specimen, semi-face view.
 - d. Left anterior spermatheca, anterior view.



Text fig. B,

C.

1. *Microscolex rivalis* n.f. ventral view of genital field.
2. *Chilota braunsi* f. *amatolae* n.f. aberrant specimen, ventral view of genital field.
3. *Chilota editha* left anterior spermatheca.
- 4a. *Chilota braunsi* f. *amatolae* left anterior spermatheca of a nearly mature specimen.
- b. *Chilota braunsi* f. *amatolae* left anterior spermatheca of a fully mature specimen.
5. *Chilota elizabethae* f. *elongata* left anterior spermatheca.
6. *Chilota laeviseta* Mich. from Mont-aux-Sources.
 - a. Left anterior spermatheca.
 - b. Left posterior spermatheca.
- 7a. Schizolobic prostomium of *Chilota elizabethae* f. *typica*.
- b. Schizoeplobic prostomium of *Chilota elizabethae* f. *typica*.



Text fig. C.

A new species of *Huernia* from South-West Africa.

By R. A. DYER, M.Sc.

[Pl. XXVIII.]

HUERNIA ROGERSII R. A. Dyer.

Humilis caespitosa glaberrima, ramis erectis 4-5 angulatis, angulis compressis dentatis, dentibus rectis vel curvis. Flores in cymis paucifloris pedicellati, pedicellis 8-12 mm. longis glabris, lobis calycis subulato-lanceolatis 10 mm. longis, corolla late campanulata margine ciliata intus superne minutissime tuberculata, lobis brevibus parvis triangularibus, lobis intermediis minimis, limbo intus saturate purpureo, tubo albo vel basi purpureo, corona exteriori disciformi suborbiculari 4 mm. diam., corona interiori purpurea 2 mm. longa 5-lobata, lobis dorso antherarum adnatis dein inflexis.

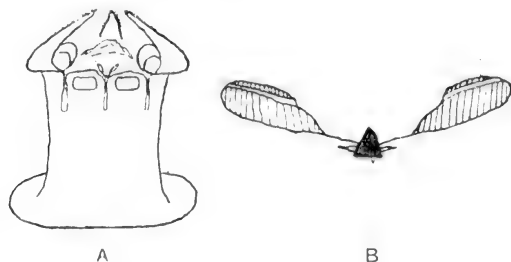
Stems tufted erect 35-100 mm. high, 12-18 mm. thick, excluding spinous projections, acutely 4-5 angled, green or mottled purplish; angles compressed, with spreading soft, deltoid acute teeth 2-6 mm. long; flowers 2-6 together near the base of the young stem developing in succession; pedicels 8-12 mm. long, glabrous; sepals lanceolate subulate 10 mm. long, glabrous equaling the expanded corolla tube; corolla acutely pentagonal in the bud, when expanded 18 mm. diam. broadly campanulate or somewhat hemispherical, gradually passing into the short lobes; corolla tube 8-9 mm. deep, lobes short acute to subacute, intermediate lobes inconspicuous, outer surface pale greenish, purple mottled, margin minutely ciliate, top half of inner surface when under microscope has minute tuberculate appearance, colour of inner surface sharply divided into two areas, the outer portion very dark purple black, the central circular portion white with light purple marking round outer corona; outer corona circular, 4 mm. diam. not lobed but showing 5 indents on drying; inner corona lobes purple, 2 mm. long, incumbent on anthers and exceeding them, converging over style but not meeting, broadened at base with dorsal ridge, sparingly hairy with terminal small tuft of



Huernia Rogersii sp. nov. From Omaruru, S.W.A.



hairs. Anthers with pollen masses lying horizontally, pollen masses somewhat elliptical with a wing, pellucid within the thickened straight upper margin.



Huernia Rogersii sp. nov.

- A. Circular outer corona, staminal column and inner corona lobes (two removed).
 B. Pollen-masses attached to triangular caudicle.

This plant has a very close affinity with *H. oculata* Hook. f. It differs from the description of *H. oculata* Hook. f. in the following points.

1. Shallower corolla tube.
2. Tuberculate appearance of corolla under high power, and margin ciliate.
3. Outer corona not five lobed but circular.
4. Inner corona lobes not meeting.
5. Pollen masses not pyriform but somewhat elliptical with a wing, pellucid within the thickened straight upper margin.

This last is a most important difference and altogether the differences justify the separation from *H. oculata* Hook. f. If the fig. t. 6658 in Bot. Mag. is correct in detail, there is no question that the plants are different species.

Hab. Omaruru, S.W.A. Coll. Rev. F. A. Rogers. Cultivated by Miss L. Britten and flowered in Grahamstown April, 1926. Dinter, Fig. 24 in "Neue und wenig bekannte Pflanzen Deutsch Sudwest Africas." Dinter referred his plant to *H. oculata* but from the fig. 24 it is undoubtedly the same as Rogers' plant. The flower is extremely pretty and delicate.

Notes on the Cyperaceae of the Albany and Bathurst Divisions.

By R. A. DYER, M.Sc.

The first published list of Cyperaceae known from the Albany District is that contained in Dr. Schönland's "List of the Flowering Plants found in the Districts of Albany and Bathurst." (Records Alb. Mus. II, p. 47-50, 1907).

Two years later the Rev. F. A. Rogers, in "Flowering Plants and Ferns found in the Divisions of Albany and Bathurst," gave practically the same list. More recently, in his "Introduction to the South African Cyperaceae" published by the Botanical Survey, Memoir No. 3, Dr. Schönland provided an excellent foundation for a comprehensive study of the family in S. Africa. In that paper, the species of the Albany district received special notice, and various interesting observations thereon were recorded.

The present paper is based on material in the Albany Museum Herbarium, which is sufficiently representative of the S. African flora and contains a large number of specimens quoted by C. B. Clarke in the Flora Capensis, Vol. VII.

Since the publication of the first list of species in 1907, the collections have considerably increased and in comparison with the 58 then recorded there are now known over 90 species from the Albany and Bathurst divisions. In view of the number of quite recent discoveries of hitherto unrecorded species, it is felt that there are yet more species to be collected in this area.

Numerically the Genus *Scirpus* is the largest, being represented by 18 species.

Many species of Cyperaceae are restricted in their distribution to stream beds and damp localities and may be of economic importance in the prevention of erosion. *Ficinia aphylla* Nees. and *F. repens* Kunth. both play an important part in sand fixation on the coast. A few species of *Ficinia*, *Bulbostylis* and *Fimbristylis* occur in the grassveld, but as stock foods they are of little economic value.

The 90 odd species recorded from this area indicate a particularly rich Cyperaceous flora and correlated with this is the interesting fact that Lower Albany, including Bathurst and the Zuurberg range, which contains the majority of these species, is termed 'sour,' whereas the Cyperaceae do not penetrate to any extent the 'sweet' veld of Upper Albany. Sufficient records of the Cyperaceae in other areas are unavailable for further comparison between sour- and sweet-veld areas, but the question is deserving of careful investigation.

Although no Cyperaceae are recorded from the most arid Karroo areas, a few species are found as perennials in our driest pastures, e.g. *Cyperus compactus* Lam., *C. rupestris* Kunth, *Ficinia tristachya* Nees, *F. bracteata* Boeck, *Bulbostylis collina* Kunth, and *Fimbristylis monostachya* Hassk. Others, again, occur in dry areas but lie dormant until favourable conditions prevail when they grow rapidly to maturity, e.g. *C. difformis* L., *Mariscus sieberianus* Nees, *Scirpus paludicola* Kunth.

It would appear likely that the characteristic alternating conditions of drought and heavy rainfall affect the frequency of the species.

Sometimes it is impossible to separate the species quite satisfactorily, and in the absence of experimental data one cannot say to what extent modifications of species are due to differences in environmental conditions, it being known that the number of limiting factors regulating growth is comparatively high. In this connection the following case is interesting:—The ordinary local forms of *Scirpus cernuus* Vahl. and *S. rivularis* Boeck. are readily distinguished; *S. rivularis* being a much more robust plant, but with smaller congested glumes, small ovate nut, very minutely punctate: *S. cernuus* is more capillary with less crowded glumes, larger, obovate, punctate nut: *S. rivularis* dries black whereas *S. cernuus* dries to a green colour and therefore, besides the morphological differences, there is probably a difference in chemical composition. *Scirpus cernuus* Vahl, and *S. rivularis* Boeck., were found together in a small stream near Grahamstown. In the same place, three other tufts were collected, and these showed a gradation of growth form from *S. rivularis* to *S.*

cernuus; they were intermediate in colour and varied in size between the two, but in fruit and glume characters were nearer *S. rivularis*. The smallest type was collected on the damp mud, and the slightly more robust forms had more water; however, it is not considered that the slight difference in water content (when both situations were saturated) was the cause of the great differences in appearance. The intermediate forms agree well with the description of *S. subprolifer* C.B. Cl., but the similarity with *S. rivularis*, especially, seems too close to warrant specific rank for the intermediate forms. What relationship there is can only be established by breeding experiments. In performing these experiments, the writer ventures to suggest that consideration should be given to Dr. Lotsys' Theory of Evolution by means of Hybridisation and Segregation. In *Cyperaceae*, where wind pollination predominates, important evidence might be expected in connection with the theory.

The characters of most importance in the separation of genera and species are the inflorescence, fruit and glume characters, and growth form. Unfortunately, a great number of specimens collected lack ripe fruit, and in many of these instances species determination has been decided on the basis of vegetative and floral characters. Even new species have been described in the absence of ripe fruit, and this has no doubt contributed much to confusion in the systematics of this family. There is in this connection an interesting complication, for the fruit, when ripening, may undergo various changes in external appearance, with the result that a nut nearing maturity, may look totally different from the fully matured nut. Clarke in the *Flora Capensis* refers to *S. cernuus* Vahl. as follows:—'outermost cells small subquadrate in very numerous regular rows, becoming on the ripe nut inflated, white, scarious (so that the nut is described subtubercular white) finally breaking up in their centres (when the nut is described as porose).' This instance is not exceptional for in *S. sororius* C.B. Cl., which was first identified in the Albany Division in 1926, the fruit undergoes similar changes. Shortly before maturity, the outer cells become inflated and white; the mature fruit is dark reddish brown,

irregularly trabeculate without the inflated outer cells. Since this observation, a specimen in the Herbarium (collected in 1922 in Botha's River valley) has also been identified as *S. sororius*. Hitherto this material had been mounted with another species under the name *Scirpus setaceus* L. The other species might be *S. setaceus* L. but the fruit is insufficiently mature to be quite certain.

The genus *Ficinia* contains a number of very closely related species, and owing to the simple form of the nut the growth form and glume characters have received greatest importance. To what extent these can be relied upon as specific characters is still uncertain, and here also is a case for experimental investigation.

The character of the inflorescence as a whole, greatly assists in classifying the genera into natural groups.

Size alone is seldom, if ever, a specific character, e.g. *Scirpus costatus* Boeck., usually 8-24 ins. high, was found near Grahamstown on the bank of a stream ranging from 10 ins. to 7 ft. in length; the latter plants being shaded and supported by a species of *Rhus*. Again *Ficinia cinnamomea* C.B. Cl. measuring according to the author 4-16 ins. high has been collected on a kopje near Grahamstown where the plant attained a height of 3 ft.

Although it is admitted that the systematics of the *Cyperaceae* leave many loopholes for attack, it is the writer's opinion that the position will not be materially improved by re-examination of herbaria specimens. The position will only be improved after a thorough study of the life cycle of the various forms under field conditions.

KEY TO GENERA.

Sub. Order I. SCIRPO-SCHOENEAE. Fertile flowers all with perfect stamens.

Sub. Order II. CARICEAE. Flowers all 1-sexual, spikelets 1-sexual or 2-sexual, if bisexual then consisting of 1 basal female flower and 1 or many upper male flowers.

Sub. Order I.

Tribe I. CYPEREAE. Empty glumes at the base of the spikelet 2 or 1, fertile glumes usually many, occasionally few or one to the spikelet, *2-ranked* (see note under Tribe II) hypogynous bristles 0, inflorescence an umbel or compound umbel or congested into a head, stem naked.

Tribe II. SCIRPEAE. Empty glumes at the base of the spikelets 2-0, fertile glumes usually numerous, glumes arranged *spirally*. Note: *Fimbristylis monostachya* Hassk. has 2-ranked appearance of glumes but an examination of the rachilla with glumes removed, shows the spiral arrangement.

Tribe III. SCHOENEAE. Empty glumes at the base of the spikelet 3 or more; fertile flowers usually 1 or few, seldom many.

Sub. Order I.

Tribe I. Style 2-branched.

Spikelet bearing 1 or 2 fertile flowers, nut compressed laterally, rhachilla deciduous.

1. KYLLINGA.

Spikelet bearing several or many flowers, rhachilla persistent.

Nut compressed laterally 2. PYCREUS.

Nut compressed dorsally 3. JUNCCELLUS.

Style 3-branched.

Rhachilla persistent. 4. CYPERUS.

Rhachilla deciduous. 5. MARISCUS.

Tribe II. Style base not falling from the nut.

Style base large 6. ELEOCHARIS.

Style base button like, minute 8. BULBOSTYLIS.

Style base falling from nut, sometimes not in *Fimbristylis* but then not leaving button like base.

Style constricted at junction with nut.

7. FIMBRISTYLIS.

Style not constricted at base.

Nut surrounded at base by membranous discus, usually on a gynophore.

10. FICINIA.

Nut without discus, sessile.

Spikelet glabrous. 9. SCIRPUS.

Spikelet conspicuously hairy.

11. FUIRENA.

Tribe III. Style 2-fid.

12. RYNCHOSPORA.

Style 3-fid.

Lowest flower of spikelet perfect, nut bearing, hypogynous bristles 6, long simple.

13. CARPHA.

Lowest flower of spikelet infertile (except in *Tetraria cuspidata* but then no bristles).

14. TETRARIA.

Sub. Order II.

Nut enclosed in a bottle like bract, deeply split down, often with a rhachilla or male spike. *SCHOENOXIPHUM*.

Nut completely enclosed in a utricule *CAREX*.

Owing to the fact that in several androgynous species the utricule is split in *Carex* also (owing to the development of the male spike) the above distinction is obscured and in consequence much diversity of opinion exists as to the correct position of specimens.

It will be noticed that the following genera are absent:—

Eriophorum L., *Lipocarpa* R. Br., *Ascolepis* Steud, *Ecklonia* Steud, *Schoenus* L., *Epischoenus* C. B. Cl., *Costularia* C. B. Cl., *Machrochaetium* Steud, *Cladium* P. Br., *Chrysithria* L., *Scleria* Berg., *Eriospora* A. Rich.

1. KYLLINGA Rottb. partly.

K. alba Nees. Usually growing in fairly dry soils amongst short grass; occurs in Bathurst Div.

K. erecta Schumach. Frequent in Albany, preferring damp situations.

K. melanosperma Nees. In water and damp soils, Brookhuizen's Poort near Grahamstown.

K. Lehmanni Nees. Scarce on Botha's Hill.

2. PYCREUS Beauv.

P. polystachyus Beauv. Occasional near Grahamstown in swamps or dry vleis.

P. lanceus Turrill, com. nov. = (*P. umbrosus* Nees). Similar situations to *P. polystachyus*.

3. JUNCCELLUS C.B. Cl.

J. laevigatus C.B. Cl. Along the coast in fresh water or salt vleis. First collected from Kowie 1917.

4. CYPERUS L.

C. tenellus L. Small annual, common on stream banks in damp mud or sand.

C. Teneriffae Poir. Occasional in short grass in dry or damp regions.

C. rupestris Kunth. Small perennial in short grass off Cradock Rd. beyond Grahamstown Golf Course. First collected 1926.

C. compactus Lam. var. *flavissimus* C.B. Cl. Occurring in either dry or damp soils, frequent.

C. semitrifidus Schrad. Scarce, Trappes Valley and Highlands.

C. difformis L. Weak annual, occasional in or near water.

C. pulcher Thunb. Larger plant up to 2½ ft. high. Common in streams, more so in vicinity of Grahamstown.

C. sphaerospermus Schrad. Medium sized plant in damp situations, more frequent in coast belt.

C. denudatus L. This may possibly be a leafless form of the preceding species. Occurs in similar habitat at higher altitudes, frequent near Grahamstown.

C. textilis Thunb. Up to 3 ft. high. Common along streams and dry watercourses at Howieson's Poort, Kowie and Blaauwkrantz stream bed.

C. albostratus Schrad. Up to 2 ft. in height, most common throughout, in shaded, dry or damp watercourses.

C. usitatus Burch. About same size as preceding species in similar habitats near Port Alfred and Grahamstown.

C. esculentus L. One plant from Belmont Valley compares well with this species but the root system is incomplete and more material and information is required before a definite decision as to its identity can be given.

C. longus L. var. *tenuiflorus* Boeck. Belmont valley.

C. fastigiatus Rottb. Stout plant 2-3 ft. high, frequent in vleis and watercourses, Bushmans R. and Brak Kloof.

5. *MARISCUS* Gaertn.

M. capensis Schrad. General throughout in grass in the vicinity of water.

M. dregeanus Kunth. About 15 in. high. Once recorded from Port Alfred.

M. pseudo-vestitus C.B. Cl. Differs mainly from *M. vestitus* C.B. Cl. by narrower leaves and more congested spike which is sometimes reduced to one head. Occasional in Trappes Valley.

Daly 674 is quoted and figured as *M. vestitus* C.B. Cl. in Bot. Survey Memoir No. 3, but agrees well with *M. tabularis* C.B. Cl. It is excluded from *M. vestitus* C.B. Cl. (a) It produces strong stolons. (b) Stem base not thickened by scarious or brown leaf sheets.

M. sieberianus Nees. Somewhat larger plant, 9 in-2 ft. high. Two specimens in Albany Museum Herb. referred to this sp. have conspicuously inflated leaf sheaths at base and possibly belong to Sect. I, but material too poor for a definite decision.

M. congestus Vahl. Common throughout, and variable in growth form, very closely related to following four species.

M. riparius Schrad. Restricted in distribution to coastal vleis.

M. involutus C.B. Cl. The longer spikelet distinguishes it from preceding. It occurs in Brookhuizen's Poort.

M. Owani C.B. Cl. Distinguished by loose spikelet; near Kowie River.

M. Gueinzii C.B. Cl. River bank Blaauwkrantz, similar to following specimen.

M. tabularis C.B. Cl. Robust plant up to 2½ ft. high, both in Albany and Bathurst Divisions.

M. durus C.B. Cl. On West Bank Kowie, occasional further inland.

6. ELEOCHARIS R. Br.

E. limosa Schult. Plant attaining height of 2 ft., found in watercourses and ponds, West Bank, Kowie, and near Grahamstown.

7. FIMBRISTYLIS Vahl.

F. ferruginea Vahl. Scarce in Fish River Valley below 1,000: fide C.B. Cl. in Flora Capensis, Vol. VII; not collected again since Drege's record before 1900.

F. complanata Link. In damp situations near Grahamstown and Howieson's Poort.

F. monostachya Hassk. Spike resembling that of a *Cyperus*. Usually in dry situations, sometimes damp. Scarce on grassy hills in neighbourhood of Grahamstown.

8. BULBOSTYLIS Kunth.

B. humilis Kunth. Small annual ½-in.—6in. high. Frequent in open scrub and margin of grassveld near Grahamstown. Troublesome weed on Kowie Golf Course (fide Drake in 1922).

B. collina Kunth. Found plentifully on grassy hills near Grahamstown and in Bathurst Division. Very variable in pubescence.

9. SCIRPUS L.

S. fluitans L. No specimen from this locality in Alb. Mus. Herb., but the species is recorded in Rec. Alb. Mus., Vol. II, part I. The writer suggests that this species was confused with *S. Ludwigii* Boeck., but its presence is not unlikely.

S. globiceps C.B. Cl. It derives its name from the globose

mature spike, otherwise like above. Occasional near Grahamstown in semi-stagnant water. Howieson's Poort. *S. Ludwigii* Boeck. Common in dongas and damp places near Grahamstown.

S. sororius C.B. Cl. Half-mile past Hamilton Dam in 'Poplar Grove' and Botha's R. valley. Very similar to *S. setaceus* from which it is separated by its 2 style branches. In vegetative appearance it is also like *S. cernuus* Vahl., with which it grows.

S. setaceus L. Salt Vlei, Kowie. This species is easily confused with *S. cernuus* Vahl. owing to similarity of vegetative growth.

S. costatus Boeck. Variable in size 8 ins.—7 ft. in length. Trappes Valley. It was found growing to a length of 7 ft. supported by a tree in a stream near Grahamstown.

S. venustulus Boeck. On Salt Vlei mud, Kowie.

S. cernuus Vahl. Common throughout on damp mud in stream beds.

S. subprolifer Boeck. Appears intermediate between *S. cernuus* Vahl., and *S. rivularis* Boeck. Near Grahamstown.

S. rivularis Boeck. In the stream beds of Howieson's Poort, and occasionally in similar habitats.

S. antarcticus L. Amongst short grass or in damp shady places near Howieson's Poort and Trappes Valley.

S. nodosus Rottb. In dry watercourses near Grahamstown and also at Port Alfred.

S. prolifer Rottb. Stem weak and flexuous. Frequent throughout in shallow water or mud.

S. holoschoenus var. *Thunbergii* C.B. Cl. In grass on sandy knolls behind Dune Bush, Port Alfred.

S. Burkei C.B. Cl. Blaauwkrantz, and Kowie in old river beds.

S. paludicola Kunth. In damp pans and dongas in neighbourhood of Grahamstown and Bathurst.

S. lacustris L. Near Webb's Dam, four miles N.W. of Grahamstown.

S. maritimus L. In salt vlei, Kowie West.

10. *FICINIA* Schrad.

F. aphylla Nees. Common on sea coast as a dune fixer.

F. repens Kunth. Common amongst grass on Kowie River bank.

F. sp. Referred by Turrill to 'near *F. punctata* Hochst.' but is more nearly allied to *F. elongata* Nees. The plant is common among rocks in wooded kloofs near Grahamstown. The specimens were collected too early in the season for ripe fruit, but the species of this affinity are separated mainly on vegetative characters and the stability of these is doubtful.

F. stolonifera Boeck. In grassveld at Trappes Valley and frequent near Grahamstown. The young plant with one spikelet to the head is almost identical with *F. pusilla* C.B. Cl. and one specimen has been named as such by Turrill.

F. tristachya Nees. Very common and variable species in short grassveld; some forms hardly distinguishable from *F. gracilis* Schrad., and others from *F. albicans* Nees.

F. albicans Nees. A form of *F. tristachya* Nees found near Grahamstown, could be placed here owing to colour and shape of glumes.

F. elongata Nees, form with few spikelets to the head, see *F. punctata* Hochst.

F. cinnamomea C.B. Cl. Occasional in rock crevices on bare kloofs, or partly shaded by trees. This species occurs at Blaauwkrantz, and on rocky hills towards Howieson's Poort.

F. sp. near the following but distinct from *F. gracilis* Schrad. in character of nut; in depression beyond Grahamstown Golf Course. Referred at Kew to *F. argyropus* Nees., but the writer cannot accept this determination as the glumes of *F. argyropus* are 'white fimbriate ciliate on edge,' whereas there is no indication of this on the specimen from Grahamstown.

F. dasystachya C.B. Cl. This may be merely a broad

leaved form of the following species. Leaves not markedly erect. Scarce near Grahamstown. The absence of a mature nut in the 'type' specimen prevents a final decision. *F. gracilis* Schrad. 6ins.—18ins. high with narrow erect leaves. Very common amongst grass throughout.

F. striata (Thb.) Kth. — (*F. setiformis* Schrad. fide Schönland in Bot. Survey Memoir No. 3). The typical form grows near Grahamstown. *var. pallens* Schrad. occurs on the coast near Kowie West Flats. Schönland in 'South African Cyperaceae' Bot. Survey Memoir No. 3 upholds the specific name *F. striata* Thb. in preference to *F. setiformis* Schrad., and includes the two species *F. lithospermum* Boeck. and *F. lucida* C.B. Cl. of the Flora Capensis. 'The extreme forms differ considerably but intermediate forms are numerous.' The writer cannot express a view on this matter owing to the small quantity of material examined.

F. bracteata Boeck. This species has a conspicuous single spikelet to the head, variable in size. Common among rocks both on open slopes and in wooded kloofs.

F. fascicularis Nees. In shady damp wooded kloofs near Grahamstown.

F. bulbosa Nees. Mouth of the Kasouga River.

F. ramossissima Kunth. Very much branched. Occasional on kopjes near Grahamstown and at Kowie.

11. *FUIRENA* Rottb.

F. hirta Vahl. Very common in damp localities throughout. *F. coerulescens* Steud. *var. apetala* = (*F. pubescens* Kunth). Hills South of Grahamstown; common in Howieson's Poort. Schönland in 'South African Cyperaceae' Memoir No. 3 disagrees to a great extent with the classification in the Flora Capensis and points out the variability of the characters used for the division into spp. He includes *F. pubescens* Kunth in *F. coerulescens* Steud. Judging from examinations of a number of specimens the writer agrees with Schönland that the Flora Capensis Vol. VII classification is unsatisfactory, but more field work is

essential before an improved arrangement can be finally substituted.

12. *RYNCHOSPORA* Vahl.

R. glauca Vahl. In or near streams, Howieson's Poort and Coldspring.

13. *CARPHA* R. Br. (partly).

C. glomerata Nees. Robust plant—6ft. high. In streams near Grahamstown and Howieson's Poort.

C. capitellata Boeck. Much smaller than above. In damp kopjes, Brookhuizen's Poort.

14. *TETRARIA* C.B. Cl.

T. cuspidata C.B. Cl. Occasional among grass in damp habitat.

T. dregeana C.B. Cl. 15 miles from Grahamstown towards Trumpeters Drift, in vlei, forming large tufts. First collected 1926.

T. involucrata C.B. Cl. Howieson's Poort. No specimen in Alb. Mus. Herb. but one in S.A. Museum from Howieson's Poort identified as this species.

SCHOENOXIPHIMUM Nees and *CAREX* L.

No completely satisfactory solution to the question of the systematic relationship between the above two genera has been decided upon, and until a classification is proved to afford a good working basis, specific determinations will be confusing.

By taking the classification in Bot. Survey Memoir No. 3 as a basis and comparing it with Flora Capensis, Vol. VII, the following synonymy should be noted with reference to species in this area.

Sch. caricoides C.B. Cl. = (*C. dregeana* Kunth).

Sch. sparteum (Wahl) Kuk. var. *Schimperianum* (Boeck) Kuk. = (*C. Bolusi* C.B. Cl.)

Sch. sparteum (Wahl) Kuk. var. *Lehmanni* (Nees) Kuk. = (*C. Esenbeckiana* Boeck).

Carex vulpina L. = (*C. Huttoniana* Kuk.) = (*C. condensata* C.B. Cl. non Nees).

C. phacota Spreng = (*C. cernua* Boott).

C. aethiopica Schkuhr, and *C. clavata* Thunb. are also recorded from Albany and Bathurst Divisions respectively in the *Flora Capensis*, Vol. VII.

Schoenoxiphium sparteum (Wahl) Kuk. would appear common throughout, also *C. vulpina* L. The remainder are less frequent.

For further information see *Flora Capensis*, Vol. VII, 'South African Cyperaceae' by Schönland, Bot. Survey, Memoir No. 3, also Kukenthal in Engler 'Das Pflanzenreich.'

Description of a new mouse from Basutoland.

By AUSTIN ROBERTS.

DENDROMUS MELANOTIS BASUTICUS subsp. nov.

The type specimen was collected by Mr. J. A. Cottrell on the top of the mountain, Thaba Putsua, Basutoland, and is now in the Albany Museum.

Description: Colour: Darker above than in any other S. African *Dendromus*, the whole of the upper parts being strongly suffused with black-tipped hairs on a buffy greyish ground colour, the base of the hairs, however, being dark grey. Underparts from chin and lips dull whitish, with the base of the hair dark grey, sharply contrasting with the upper parts. Hands and feet white, the upper parts of arms and legs merging into the colour of the adjacent parts of body. Ears mainly black, with a small white patch at the anterior base. Tail dark brown above, whitish below. The black dorsal stripe does not show up in such contrast with the back as in other forms, but can be traced from between the shoulders to the rump.

This dark coloured form is apparently peculiar to the Basutoland Mountains, in dimensions the same as in the typical *D. melanotis*, but differing markedly in having the general coloration above very much darker. Unfortunately, the skull has been smashed in its capture and the parts that remain cannot be satisfactorily compared with those of other forms. Nor has it been measured in the flesh. In the skin the head and body measure approximately 70 mm., tail 75 mm., hind foot (s.u.) 16.5 mm. What there is of the skull measures: greatest width 11.2 mm., width of brain case 10 mm., length of nasals 8 mm., interorbital constriction 2.8 mm., length of upper molar series 3.3 mm., diastema 4.5 mm.

Note on a stone axe from Fort Hare.

By REV. P. STAPLETON, S.J.

[with Plate XXIX].

This axe was found by Dr. V. Lebzelter in the grounds of the Presbyterian Hostel at Fort Hare, near Alice, in December, 1926. It lay in a heap of material taken from the foundations of the hostel, and is evidently derived from the ironstone gravel occurring about 15in. below the surface of the ground, as the granules of limonite adhering to its surface indicate.

Description.

It is a very symmetrical pear-shaped implement, made from a large flake of Karroo shale, and probably perfect except for an old fracture across the "tang." The broken surface of this fracture, and the surface generally, shows stains from lying in a bed of ironstone gravel. The *upper surface* has a slight ridge extending longitudinally from the base to over half way along. The right edge is flaked inwards from the edge all along from the base to the point, the length of the flakes varying from $\frac{1}{2}$ -in. to 1in. From the left edge only one or two flakes have been struck. One large flake over an inch in width has been struck from the left edge to form the shoulder of the tang and the groove thus formed has been deepened by further flaking. A flaw in the material runs parallel to the edge about two-thirds the length from the base.

Under surface. The right side has been flaked from the edge inwards the whole length of the implement. The left edge has had a few larger flakes removed and one flake over 2in. broad and $1\frac{1}{2}$ in. long has been struck off to form the shoulder of the "tang."

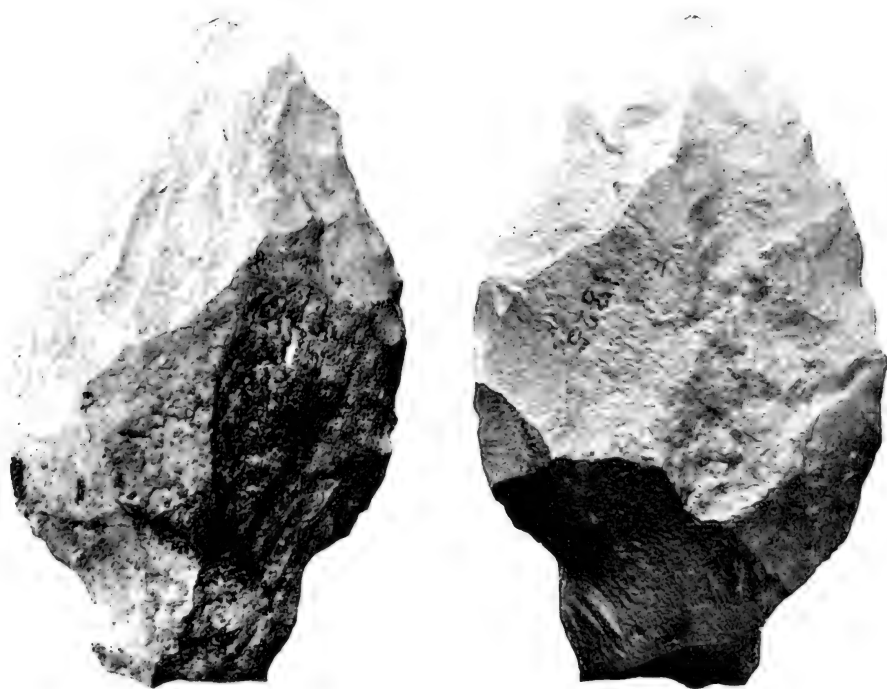
The "tang" itself is very distinct and is the most remarkable feature of the implement. It is 2in. in breadth and in its present state is about 1in. in length. But it has evidently been broken across transversely and its original length cannot be now determined. The point is obtuse.

Dimensions.

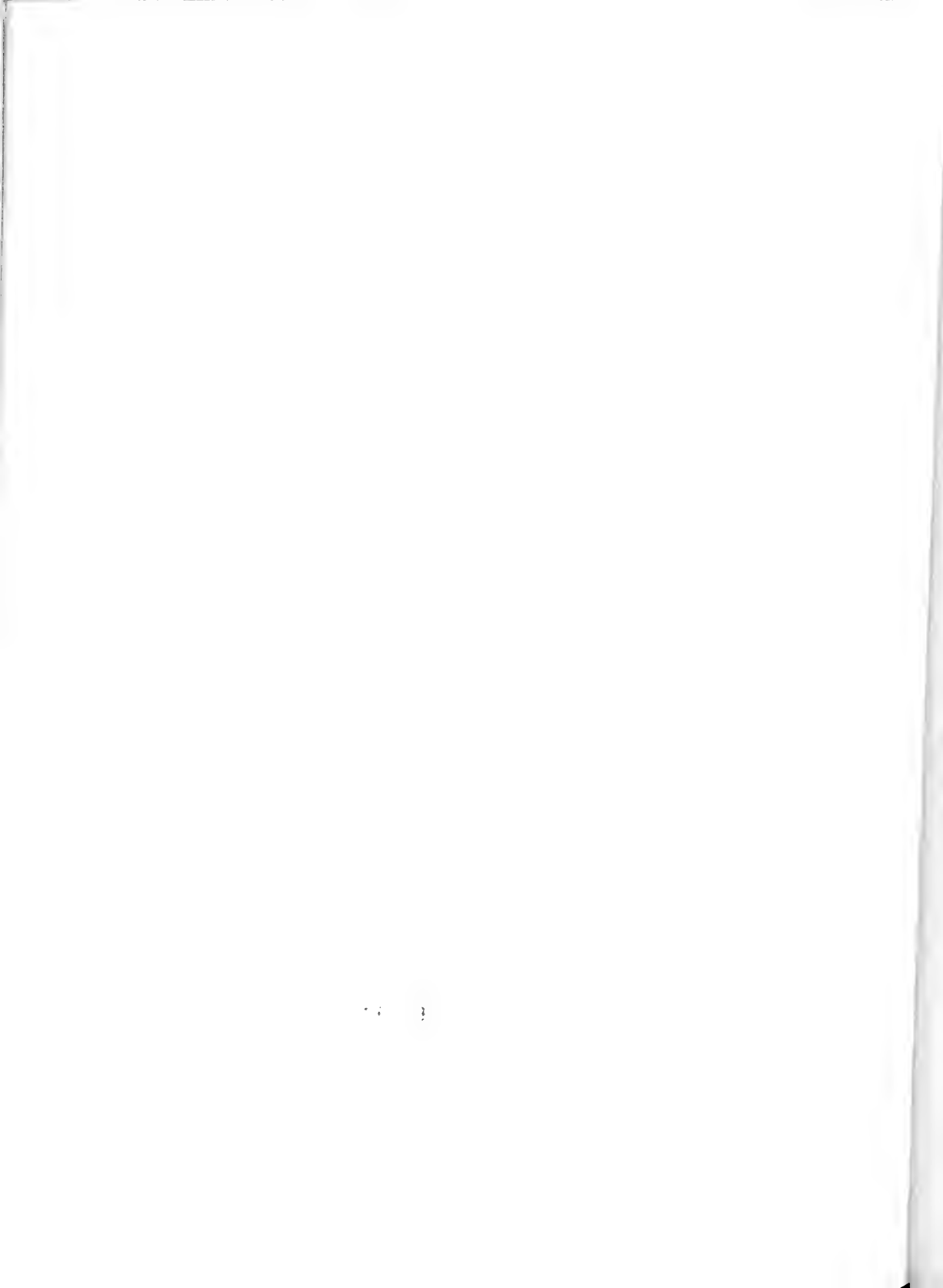
Full length (including "tang") 7in. Length of "tang" $1\frac{1}{2}$ in. Breadth of shoulder 4in. Breadth half way down 4in. Breadth two-thirds down 3in. Thickness—maximum in centre $1\frac{1}{4}$ in., to $\frac{3}{4}$ -in. near point.

The weight is 27 ounces.

As far as is known to the writer, no "tanged" axe comparable to this specimen has been found before in South Africa. In the collection of Mr. C. Gladwin there is however a specimen from Middledrift, C.P., which has the basal end somewhat prolonged and narrowed although it does not show a definite tang.



FLAKED CELT
from Fort Hare.



Notes on some small mammals found near Kei Road

By GORDON RANGER.

The country about Kei Road may be described as hilly with forest and scrub, and in parts, more or less flat. It is always thickly grassed, there being no sandy tracts or parts with a sparse vegetation.

The first inhabitant to be mentioned is an arboreal species the Cape Dormouse (*Graphiurus murinus*). This is a hibernator, making use of stores of various large seeds in warm weather. One which we found in a dormant state, recovered its active condition in our pocket. Whether it issues from its winter retreat on warm nights or not is uncertain. It may sometimes be found several hundreds of yards from its true home, the forest.

Of the Otomyd rats only *Otomys irroratus* occurs. It lives in the forest-patches and kloofs where, at one time, about five years ago, it was sufficiently abundant to have many regular beaten paths, and to be seen at all times of the day, sometimes gnawing at rhizomes just beneath the surface. In a short time it became scarce and at present is rarely seen. Possibly this rather sudden decrease in its numbers is attributable to thinning by an assemblage of owls, hawks, and carnivora. We have found many of its skulls in castings of the Grass Owl (*Strix capensis*), which is wont to devour its nightly catchings at a fixed spot.

The commonest species of rodent is the Striped Rat (*Rhabdomys pumilio*) which is partial to all places with a long and dense growth of grass. To enjoy the warmth of the sunshine on cold wintry days, it will ascend to the top of a dense matted growth. Burrows are used as ready retreats when, as is sometimes the case, it is content to live in somewhat exposed situations. Its diurnal habit is never abandoned apparently.

Mus dolichurus, the Long-tailed Tree-Rat, is active only at night, and passes the day in a nest of grass and moss within a hollow tree where three or four adults may be found together. It neither stores nor hibernates. In winter it subsists largely upon

the seeds, when available, of a common "Wild Grape." The purple berries are transferred to a horizontal surface on a tree where the seeds are removed from the fleshy portion.

Three of these rodents which were kept in captivity, carried most of their food into a hollow log provided for them. The inedible portions of their food accumulated and eventually the log became full. This does not happen under natural conditions: in the cage the rats were subjected to much disturbance.

The Multimammate Rat (*Mus coucha*) is not uncommon in out-houses, stacks of forage, and grain lands. Its nest with young has been found underground. Others of the Murinae which can be only listed are the tiny Field Mouse (*M. minutoides*), and that undesirable alien species, the Black Rat, and the House Mouse.

Of the Cricetid rats we have the typical form of *Mystromys albicaudatus*, a fairly large creature with soft fur, large eyes and a short whitish tail.

It is nocturnal, and lives in burrows out upon the open veld where the grass is short. It does not construct its own burrow, but utilises those of the golden mole: these are opened through old (not new) flattened mole "hills," and may be recognised by the enlarged entrance and a small quantity of earth scraped out near it. The burrows are not used as permanent homes: new ones are opened, and those previously occupied are abandoned. Thus, the burrows in an inhabited area occur usually in separate groups, many of which are in a disused state. It appears, then, that these rodents live in small parties, and that their movements from place to place are correlated with the waning of the food-supply around their burrows. The food includes two exhaustible items, Acacia seeds, and small bulbs dug from the soil.

Two well-known eastern rodents are the Mole-Rat (*Georychus hottentotus*) and the Cane-Rat (*Thryonomys swinderenianus*). The long dense grass of the valleys, hillsides, and forest-borders affords the cane-rat such excellent cover that the use of burrows is unnecessary. From this cover, paths may lead to a special feeding ground, often the farmers' maize-

field. This rodent is not easily captured by dogs: it has the baffling habit of running swiftly under cover and then stopping suddenly. This is repeated when its pursuer comes near.

Of the bats, *Vespertilio capensis*, *Pipistrellus kuhlii fuscatus*, and the Zululand Horse-shoe Bat (*R. augur zuluensis*) are known. The commonest is the first named which enters our dwellings at night. During the day it hangs—among other places—under the loose bark of forest trees.

The Zululand Horse-shoe Bat is known from a small cave of which it seems to be the sole occupant. Upon one's entry into this cave with a light, some of the bats become alarmed and fly. On the other hand others, beyond twitching their "nose-leaves," show no alarm and allow themselves to be taken from the rock-wall.

We come now to the Insectivora of which we can speak of only three with surety.

Pachyura varilla is a small grass-inhabiting shrew less than two inches in length (head and body). A specimen kept in a box a day or two, showed itself to be an active creature, able to run rapidly, and to jump several inches. It ate spiders and grasshoppers which it seized with a rapid snatch.

A Golden Mole, *Amblysomus hottentotus* is common here as elsewhere in the Eastern Province. An admirable creature is *Chrysospalax trevelyani*, The Giant Golden Mole which may well be included with the least known South African mammals. It measures so much as nine inches in length, and has coarse dark brown hair overgrowing a warm woolly underfur. Its home is the forest and at present the species is known from Pirie, Kei Road and Pondoland.

This giant mole, partly diurnal in habit, is a surface feeder, and in searching for its food (insects in all stages of development, and pillmillipedes) stirs up the floor of the forest, employing mainly its snout: winding furrows and small excavations are thus formed. When searching for food, its limbs are hidden from view, as also the nose which is held well under. Its acute sense of smell enables it to detect its food of which the supply in the loose soil and beneath the decaying leaves is plentiful;

which fact one may learn on hearing the oft repeated sound of chitin being crushed between its teeth. Often it will thrust its snout into a small hole and remain motionless many seconds. Although one may watch it closely when it is intent upon food-getting, the presence of a human observer is eventually detected, and the creature moves off as fast as its specialised feet permit it. Being of a very inoffensive nature it does not attempt to bite when handled.

It shows no fear of water, and one whose nose we applied to the water, essayed to escape. Upon being released it swam across the stream, using its feet as paddles, and alternately raising and submerging its snout. We are inclined to believe it is not unaccustomed to the water into which it is liable to tumble during its wanderings. Moreover its quest for food takes it over very wet gravel and leaves in the bed of the stream.

Its life underground is still obscure. Mole-hills occur in its haunts, but the burrows beneath are far too small in bore to permit of the passage of this giant through them; so that at present we prefer to say that it does not burrow underground in search of food. Several have been found dead at the bottom of fencing holes where the ground was too hard for burrowing.

Permanent holes—many equal in diameter to that of the mole itself—are used as retreats year after year. Some of these are situated amongst the roots and stones at the bases of large trees.

The above pertains to the Giant Mole in the warm season only. At the advent of the cold season, about April, all indications of its activity come to an end. Near the end of August there is a reappearance. What does the Giant Mole do in winter? Apparently, it lies dormant.

Omitting the larger species, all the animals mentioned above are those known with certainty to occur. Undoubtedly there are others to be found. There is evidence of the occurrence of Tree Mice (*Dendromys*) and at least one other shrew. Another surface-feeding mole (*Bemataiscus villosus*) of the grassveld, is said to range from Kingwilliamstown to Natal and Transvaal, but we have not met with it.

On the supposed skin impressions of *Procolophon*.

By R. BROOM, D.Sc., F.R.S.

During 1924, the famous European palaeontologist Baron v. Huene visited South Africa, and besides making a careful study of the various fossil zones in the field, examined all the more important specimens in our museums. At Grahamstown he spent a few days examining the collections in the Albany Museum, and among the specimens which interested him most were the large series from Fernrocks which reveal nearly every detail of the structure of *Procolophon*. Many years ago, v. Huene had published an important paper on the European allies of *Procolophon*, and as the Albany Museum collection is by far the most important of this remarkable lizard-like Anapsid, he could not fail to be specially interested in these specimens.

In 1902 I spent a month at Grahamstown, and made a catalogue of the specimens. Among them I found one which in my opinion did not show remains of *Procolophon*, but of a small Labyrinthodont, possibly a species of *Micropholis*; and, on the evidence of this specimen, I placed *Micropholis* in the *Procolophon* Beds in the attempt which I made in 1907 to place the known genera of vertebrates in the various zones.

There has just appeared this year a short paper by v. Huene giving notes on some South African specimens, and in it he gives a short account of the specimen which in 1902 I regarded as *Micropholis*, and which he is inclined to regard as an impression of the skin over the back part of the skull of *Procolophon*. His note is short and may be quoted in full:—

"*Procolophon trigoniceps*. Among a great amount of material of this form in the Albany Museum, from Fernrocks (Middelburg District), there is a specimen showing an impression of the posterior part of the roof of the skull with the big foramen parietale and a minutely sculptured surface round it (fig. 1). In no other specimen is this finely grooved sculpture seen. The surface of the bones of the skull is always quite smooth, even round the foramen parietale. Therefore, I am

compelled to take this surface for the skin ornamentation. It must have been a thick leathery skin, showing very small polygonal grooves with thick meandering walls between them, somewhat like the surface of the skulls of some stegocephalians, only very much smaller. The interesting fact is, that if this is really skin, it does not cover the foramen parietale, which has a diameter of 12 mm. This would give evidence that in the foramen parietale of *Procolophon* there was still a functioning organ. Not even the border zone of the large foramen was covered with the skin.

"The breadth of the preserved surface is 45 mm. and the length 17 mm. If it were an impression of the bone and not skin, the sutures should be clearly visible; but there are none, not even in the middle line."

Mr. J. Hewitt, Director of the Albany Museum, has forwarded to me the specimen on loan at my request that I might have a further examination of it.

The specimen in my opinion cannot be the skin of *Procolophon* for various reasons. A large number of specimens of *Procolophon* are known, some of them complete skeletons with every bone in undisturbed position; but in these perfect skeletons no trace of an ossified skin has ever been met with. Further, the supposed parietal foramen is very much larger than the foramen in the largest known *Procolophon* skull. There are numerous other bones in the specimen in association with the sculptured structure, but none of these are bones of *Procolophon*.

It seems to me, there cannot be the least doubt that the specimen is the side of the skull of a small Labyrinthodont or Stegocephalian, as I believed when I first saw the specimen in 1902 and that the large opening is the right orbit.

V. Huene says, "if it were the impression of the bone and not skin, the sutures should be clearly visible, but there are none." In Stegocephalians with sculptured cranial bones sutures are often very difficult to make out. For example, though many perfect skulls of *Eryops* were known and had been carefully examined, no one was ever able to trace all the sutures till I followed them all out in 1913. The same is true of *Lydekkerina*,

a small South African Stegocephalian, allied to the Fernrocks specimen, and the cranial sutures of which were first traced by me in 1915. In such specimens, the sutures can be traced by following the thin line of matrix among the sculpturing of the bones. If however we have only a cast of the cranial surface, the tracing of sutures would be very difficult as there would be no differently coloured matrix. Now this Fernrocks specimen is only a cast with none of the original bone remaining. But even though only a cast, a number of sutures can still be made out.

The specimen shows not only the orbit but the large nostril and at least one tooth. On the same stone are numerous other casts of bones all of which are apparently of the same small Stegocephalian. Of these, the most interesting are portions of the palate and of one mandible.

The specimen is too imperfect to ascribe it certainly to *Micropholis*. If Watson's figure of the palatine of *Micropholis* be correct, then the Fernrocks specimen cannot be *Micropholis*. Not improbably it is a new genus and species allied to both *Micropholis* and *Lydekkerina*, but too poor to be made a satisfactory type.

